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73 T.M.

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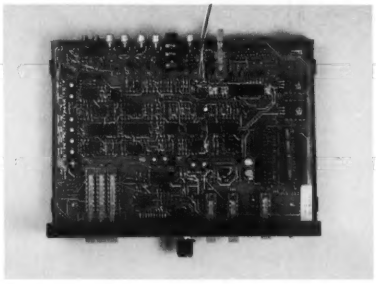

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Complete 73 contest results start on page 65.

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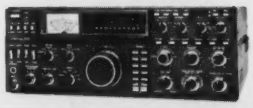

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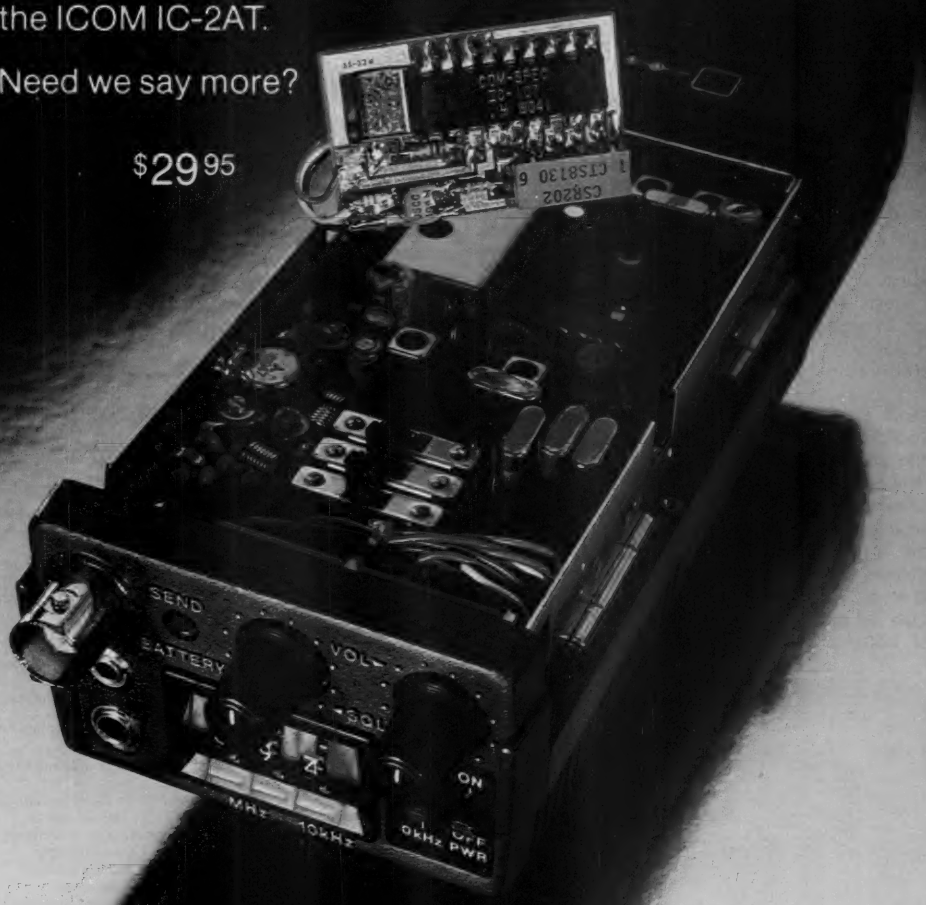

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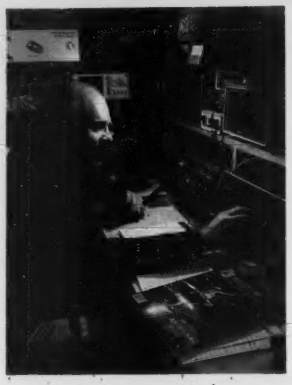

W2NSD/1
NEVER SAY DIE
editorial by Wayne Green

STAR WARS

Zaaap, goes the laser beam! But if that was my ship doing the fighting, you can bet I'd spend the extra money for a radar system to aim the lasers and not send a Wookie to do a radar's job.

Lasers and fiber optics are the way things are going for communications. It's the only system which provides the bandwidth needed to get enough information through in a short time. Just look at the way we've had to screw up television, which is lousy enough, in order to send even a fuzzy slow-scan picture over amateur-radio channels!

It's information and bandwidth. If you want to send more information per unit time, it takes more bandwidth. A normal television picture takes about four MHz of bandwidth. With slow scan, we cut the lines to one-third and the pictures per minute from 3,600 to seven... and presto! We can get the information through a 2,500-Hz bandwidth window. It's fuzzy and there are eight seconds for the voices from the adjacent channels to tear up the picture, but those hardy SSTV folk keep at it, getting very nice pictures occasionally.

The information for TV pictures is analog, so it suffers from noise. If you record a TV program with your VTR and then re-record it on a second VTR, you'll see the degradation of the analog signal. Each copy is called a generation, and it doesn't take many to lose most of the information. It's the same with audio tape recorders. With digital communications, the hundredth generation is identical to the first—quite a benefit. There's no gradual signal loss to noise.

It was this aspect of digital communications which got me involved with RTTY 35 years ago. We had a ball in those days. Under the guidance of John Williams W2BFD, we had a wonderful two-meter network running, complete with a RTTY repeater atop the New York City Municipal Building. RTTY wasn't permitted on the other bands then. Oh, I experimented with it on 80m and made contacts as far as California (W6NRM), but I had to use on-off keying instead of frequency shift, so it wasn't nearly as effective.

On two meters we had auto-call and auto-answer going fine. We could set our systems to print everything sent on the channel or to be selective and only look for messages addressed to our station. Paper was cheap, so I let my machine copy it all, wading through a floor full of copy when I'd get back from a weekend away.

Now, of course, you don't need paper unless you want a permanent copy for some reason. And instead of those big, noisy clunker Model 12 Teletype® machines, we use an inexpensive computer such as the Commodore 64. Even an old used $50 TI-99/4A will do it just fine. And you use a disk to save the weekend of information instead of a hundred yards of paper. You really should try RTTY now.

It's getting time to get the paper out of communications—even with magazines. I've been thinking about that. The old bandwidth problem again. If you are going to get *73* electronically, it is going to take either a whole lot of bandwidth or a lot of time. The halftone pictures we use in printing are darned near digital. Look at 'em with a good magnifying glass. By making a few more lines per inch, we could go digital. Or we can send four bits for each halftone dot and have 16 levels of dot. We

Continued on page 72

QSL OF THE MONTH

To enter your QSL, mail it in an envelope to *73*, 80 Pine Street, Peterborough NH 03458, Attn: QSL of the Month. Winners receive a one-year subscription (or extension) to *73*. Entries not in envelopes cannot be accepted.

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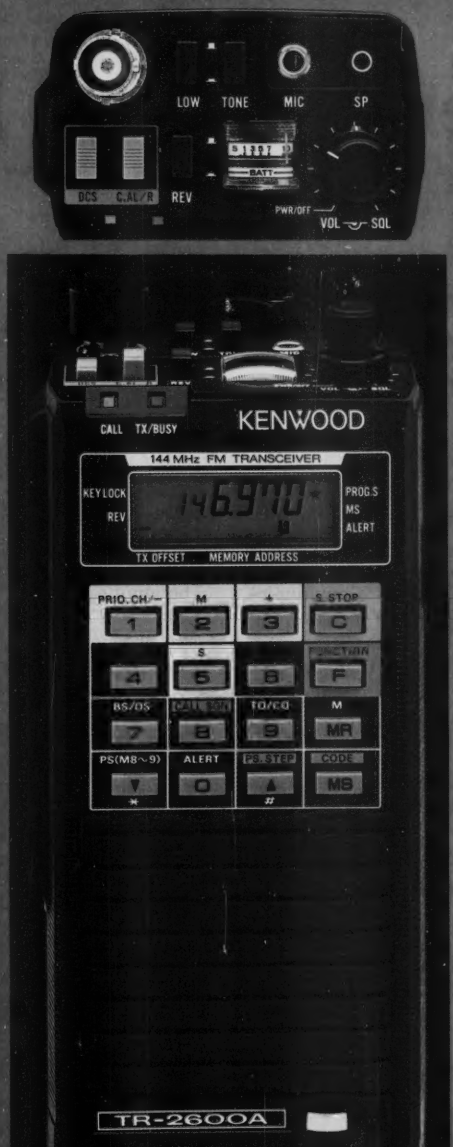
Memory scan, scans only those memories in which data is stored, and memory lock-out allows you to skip selected memory channels



without loss of data previously stored! Manual Scanning UP/DOWN in 5-kHz steps and programmable automatic band scan are also useful features. The TR-2600A has a built-in "S" meter on the top panel which also indicates battery level when in transmit mode. Extended frequency coverage, 142.000-148.995 MHz allows transmit capability in 5-kHz steps for simplex or repeater operation on most MARS and CAP frequencies. Receive frequency coverage includes 140.000-159.995 MHz.

These features only tell part of the story. The TR-2600A also has keyboard frequency selection, built-in 16-key autopatch encoder, "TX STOP" switch, HI (2.5)/LOW (300 mw) power switch, REV switch, "SLIDE-LOC" battery pack, high efficiency speaker, BNC antenna terminal, and all of this in an extremely compact and lightweight package!

Kenwood's TR-2600A, with D.C.S., leads the way in high technology handheld transceivers!

Optional accessories:

- TU-35B built-in programmable sub-tone encoder
- ST-2 Base Stand
- MS-1 Mobile Stand
- PB-26 Ni-Cd Battery
- DC-26 DC-DC Converter
- HMC-1 Headset with VOX
- SMC-30 Speaker Microphone
- LH-3 Deluxe Leather Case
- SC-9 Soft Case
- BT-3 AA Manganese/Alkaline Battery Case
- EB-3 External C Manganese/Alkaline Battery Case
- RA-3, 5. Telescoping Antenna
- CD-10 Call Sign Display

More information on the TR-2600A is available from authorized dealers of Trio-Kenwood Communications, 1111 West Walnut Street, Compton, CA 90220.

TR-2600A Subject to FCC approval. Specifications and prices are subject to change without notice or obligation.

Counter-Productive Basics: Part II

How hard can counting be? K4IPV tells us where the errors occur and how to fix them.

Joseph J. Carr K4IPV
5440 So. 8th Road
Arlington VA 22204

In the first installment of this series, we discussed the basics of digital frequency counters (DFC). We started with a discussion of the basic J-K flip-flop and then proceeded to develop its role in binary- and decade-counter circuits. In this installment, we will discuss applications of the DFC and some user problems.

DFC Input Circuits

The input stages of the DFC amplify and waveshape the input signal to make it compatible with the digital logic circuits of the counter. Most of the time, the input signal will not be a square wave or fast-risetime pulse as required by the digital circuits, but rather it will be an ac signal.

Fig. 1 shows a counter-input stage. The input amplifier builds up the signal and feeds it to the trigger circuit (often a Schmitt trigger). At frequencies below UHF, most counter-input amplifiers have an input impedance of 1 megohm shunted by some capacitance (often 20 pF). At VHF frequencies, however, this can lead to false counts or lowered sensitivity because of standing waves on the line. At those frequencies, the input cable acts like a transmission line. If this problem is experienced, it is possible to overcome the limitation by placing a 50- or 75-Ohm barrel attenuator in the line at the counter input. Provided that only 1 to 6 dB of attennuation is used, the loss of signal is balanced by achieving a matched input impedance.

The input signal very rarely will be the nice, clean square waves required for proper operation of the digital logic-circuit elements used to make a counter. The signals also may be too low in amplitude to operate the digital logic circuits or may be too noisy. Remember, a TTL flip-flop needs to see fast rise and fall times (i.e., good square waves) and amplitudes greater than 2.4 volts or they will not operate properly.

The input signal, then, is passed through two processing stages: an amplifier and a trigger. The amplifier is a wideband voltage amplifier with enough gain to build up the minimum allowable signal (usually 25 to 100 mV) to a level great enough to drive the trigger stage (i.e., 500–1000 mV).

The trigger stage is a

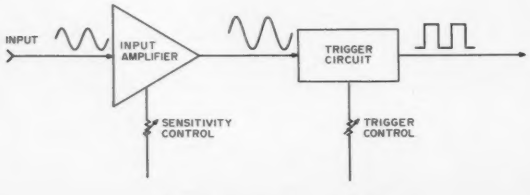


Fig. 1. Counter-input stage.

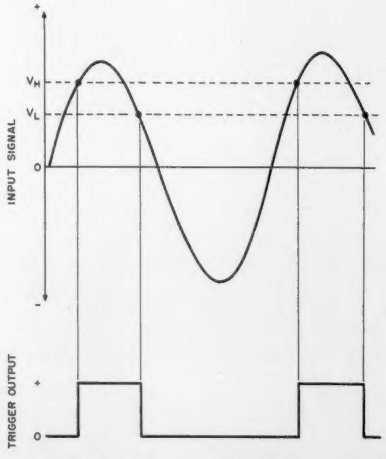


Fig. 2. Normal operation of a trigger circuit.

Schmitt-trigger circuit with a built-in hysteresis. This type of circuit is used to clean up irregularly shaped signals by making them into square waves. Fig. 2 shows the normal operation of a trigger circuit. The output snaps high when the input signal crosses the lower hysteresis limit and remains high until the signal crosses the upper limit in a negative-going direction. The hysteresis window is the quantity $(V_u - V_L)$. Note that the trigger output possesses the shape and amplitude required by the digital circuits that it drives.

It is a fundamental rule that input signals must cross *both* hysteresis limits or no count will be entered by the DCA. In Fig. 3, (a) shows the required situation: the input sine wave crosses both limits, but in (b) the sine wave crosses only one of the window limits, so no count is registered on the DCA.

Some counters have a *trigger-level* control that allows the user to adjust the position of the window over a wide range. Other models use a three-position switch labeled +, preset, and −. The switch allows the window to be placed in any of three locations (see Fig. 4). A continuously-variable trigger-level control allows positioning of the window *anywhere* within the range. Note that neither the continuously-variable nor the three-position-switch type of controls varies the *width* of the window $(V_u - V_L)$, but only the position. However, some counters are equipped with a trigger-amplitude control which *does* allow the operator to vary the width of the hysteresis window.

There are several factors that tend to reduce the accuracy of an electronic counter, and these can be grouped as *inherent errors* or *signal-related errors*. The inherent errors are a function of the quality, age, and history of the individual counter. Little can be done about these unless their source is a serious need for recalibration of the timebase. Signal-related errors, on the other hand, often are correctable by proper manipulation of sensitivity, trigger-level, and trigger-amplitude controls.

Inherent Errors

There are two sources of inherent error in all frequency and period counters: timebase error and a ±1 count ambiguity.

The timebase error is expressed in terms of a percentage or in parts per million. The error from timebase inaccuracies is directly reflected in all measurements of frequency or period. For example, suppose a 1-Hz timebase is off by 30 Hz (e.g., it is actually 1,000,030 Hz instead of 1,000,000 Hz). This is an error of 30 parts per million (30 ppm), which is [(1,000,030 − 1,000,000)/1,000,000] × 100, or 0.003%.

The measurement error due to timebase inaccuracy is constant regardless of the frequency being measured. That is to say, there will be a 0.003% error at 1 kHz and the same 0.003% error at the maximum frequency that the device will measure. For example, a 27-MHz signal would be measured with an error of (27 MHz × 30 Hz)/MHz = 810 Hz. This means that a counter reading 27,000,000 indicated that the actual frequency is 27 MHz ±810 Hz. In other words, the actual frequency lies between 26,999,190 Hz and 27,000,810 Hz.

If the timebase frequency is low, then the counter reading will be high.

Total timebase inaccuracy is the sum of several individual errors: *initial error, short-term stability, long-term stability, temperature change,* and *line-voltage change.*

The *initial error* is the calibration error at the time the timebase is intially adjusted at the factory, or at recalibration in a metrology laboratory. Different methods are used to measure the timebase frequency, but in most cases the timebase-oscillator frequency is compared with standard-frequency broadcasts of the National Bureau of Standards radio stations WWV, WWVB, or WWVH. Alternatively, it might be compared with the output of a cesium- or rubidium-beam atomic clock.

The *short-term stability* is the timebase-oscillator frequency drift per day. *Long-term stability* is the frequency drift per month, and is often designated the *aging rate.*

The *temperature-* and *line-voltage-stability* specifications refer to the frequency change over the 0–50° C temperature range, and ±10 percent line-voltage change, respectively.

There are four different classes of counter timebase: *ac line, room-temperature crystal oscillator, temperature-compensated crystal oscillator* (TCXO), and *oven-controlled crystal oscillator.*

The use of the 60-Hertz-ac line as a counter timebase is limited to the very cheapest models and a few low-grade older units. Even low-cost units today have a crystal

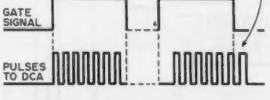


Fig. 5. Lack of synch between input signal and timebase.

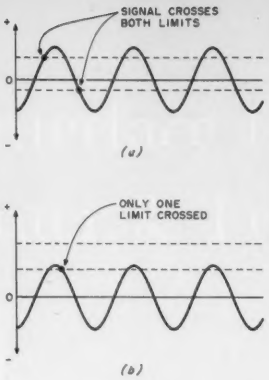


Fig. 3. The sine wave crosses both hysteresis limits in (a) but not in (b).

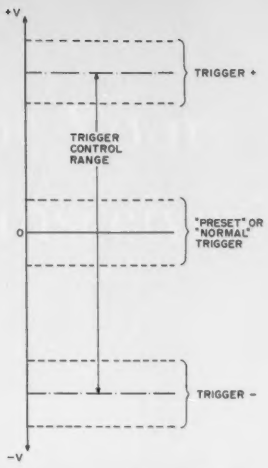


Fig. 4. Three-position trigger-level control.

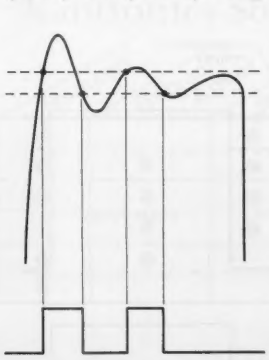


Fig. 6(a). Spurious counts created by extra crossings.

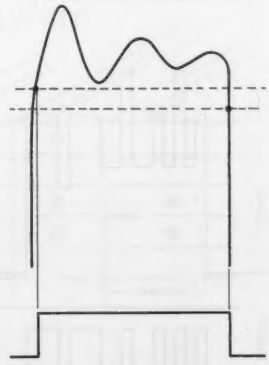


Fig. 6(b). Trigger-level control avoids spurious counts.

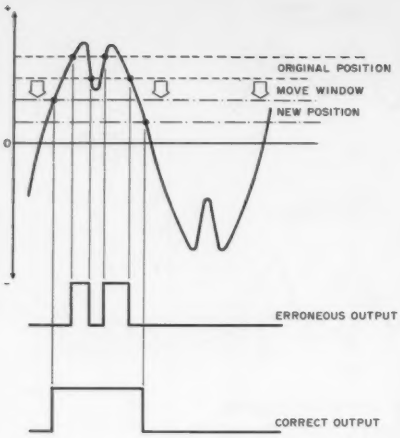


Fig. 7. Harmonic distortion of sine-wave-input waveforms.

oscillator for the timebase, and even though the crystal is operated at room temperature, it provides better accuracy than the 60-Hz power mains. Note that power companies typically will quote very high accuracy figures for their power plant's operating frequency, but these are frequency averages over a very long time. The short-term accuracy, which is what concerns counter users, is terrible.

The TCXO is an encapsulated oscillator that is specifically compensated against temperature changes. The TCXO provides at least an order of magnitude better stability than room-temperature oscillators. The TCXO is less expensive now than in the past, so even moderately-priced counters now offer TCXO stability.

The oven-controlled crystal oscillator places the crystal (and in some cases the rest of the oscillator circuitry) inside an oven, or thermal chamber. Thermostat ovens are considered an order of magnitude better than TCXO designs, while the proportional-control type of oven is from one to two orders of magnitude better than TCXO.

Table 1 lists typical stability specifications for several models of counters by several different manufacturers. Note that the short-term stability is given only for the oven type of timebase. The TCXO and crystal oscillator must be operated for a full 24 hours before the stability reaches the specified level. At operating times less than 24 hours, the stability is poorer. Some models use a separate regulated power supply for the TCXO that is not turned off by the main power switch. Rechargeable batteries are used in portable models for the same purpose, so the TCXO is not turned off while the counter is being transported between job sites.

	XTAL	TCXO	OVEN
Long term aging (per mo.)—	5×10^{-7}	2×10^{-7}	5×10^{-10}*
Short term aging (per day)—	—	—	10^{-10}
±10% line voltage—	10^{-7}	10^{-8}	10^{-9}
Temp. 0-50°C (ambient)—	10^{-8}	10^{-7}	10^{-9}

*After 24-hour warmup.

Table 1. Typical stability specifications.

The ± count ambiguity is caused by the lack of synchronization between the input signal and timebase. This is illustrated in Fig. 5: During period T_1 seven pulses are gated into the DCA while during T_2 only six pulses reach the DCA. On some subsequent count, it may be that eight pulses are gated into the DCA. One fundamental rule for all digital-counter instruments is that there is an error of ± count of the least significant digit. In other words, a counter that reads, say, 10,000 Hz is measuring a frequency that lies between 9999 Hz and 10,001 Hz, i.e., 10 kHz ±1 Hz.

The ± count ambiguity produces an error that is inversely proportional to the frequency being measured and the gate time:

$$\text{Error (\%)} = \pm 100/fT$$

where f = the frequency being measured, in Hertz, and T = the time the gate is open, in seconds.

For example, let's find the percentage error due to ±1 count ambiguity at (a) 2 MHz, and (b) 27 MHz, for a gate time of 1 second.

Solution:

(a)

Error = $\pm 100/fT$

Error = $\pm 100/(2\times10^6$ Hz) (1 sec)

Error = ±0.00005 percent

(b)

Error = $\pm 100/fT$

Error = $=100/(2.7\times10^7$ Hz) (1 sec)

Error = ±0.000004 percent

The error is ±1 count regardless of the frequency being measured, so the *percentage* of error decreases for higher frequencies: Compare (a) and (b) above.

Signal-Related Errors

Poor signal quality can introduce errors that add to or subtract from the true count. Most of these errors

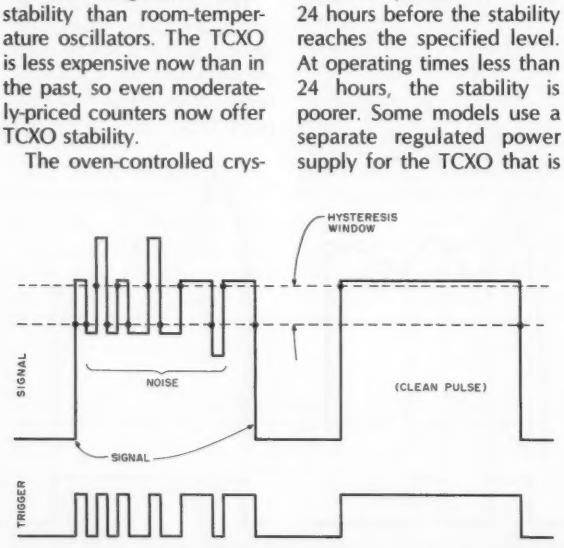


Fig 8. Impulse noises cross the hysteresis window.

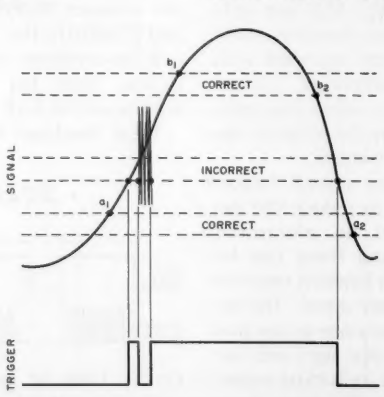


Fig 9. Correct and incorrect window positioning.

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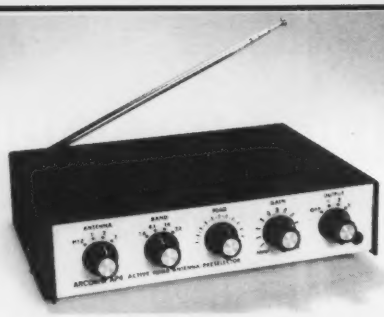

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result from hysteresis-crossing or noise on the signal.

Trigger errors occur because the input signal crosses the hysteresis window limits too many or too few times. We saw in Fig. 3(b) that a signal will fail to increment the DCA if it does not cross *both* limits of the hysteresis window, causing too low a count.

Fig. 6(a) shows how severe ringing on a signal can create extra, spurious counts of the DCA if the trigger-level control is adjusted so that the ringing portions of the signal cross the limits, creating additional "input" pulses, a two-count error. The cure is to adjust the trigger-level control so that the ringing portions of the waveform fall outside the window limits—see Fig. 6(b).

The same problem exists on sine-wave-input waveforms (Fig. 7) that have a large amount of *harmonic distortion.* The cure is the same, however. Readjust the trigger-level control so that it is operating over a lower portion of the waveform.

Similarly, impulse noise riding on the signal can have an amplitude sufficient to cross both limits of the hysteresis window. An example of this phenomenon is shown in Fig. 8, in which a pulse in a symmetrical wave train is carrying impulse-noise artifacts. In the case shown, the noise bursts cross the window limits and thereby force the trigger output to create extra pulses instead of just one.

Once again, the correction requires readjustment of the trigger-level control to a point further down the waveform. In the case of a non-square wave, the noise may appear on the leading or trailing edges and still cause the problem. Fig. 9 shows the proper and improper positions for the hysteresis window on such a waveform.

Note that filtering of the noise is not usually feasible because of the bandwidth requirements of the input amplifier.

Fig. 10 shows a type of noise error that is particularly troublesome on period measurements. In this example, noise rides on a signal that has a shallow slope, and so creates a band of uncertainty around the signal. The trigger circuit should produce a high output when the signal crosses the upper limit and drop low again when the signal crosses the lower limit, but noise impulses adding to or subtracting from the signal amplitude could provide premature or delayed trigger transitions. The correct duration of the trigger output pulse in Fig. 10 is $(t_5 - t_2)$, but under worst-case conditions the actual duration may be as much as $(t_6 - t_1)$, and that amount represents a considerable error.

The solution for this problem is to cause the signal to slew through the hysteresis band as *rapidly* as possible. Two methods can be used to implement this solution. One is to narrow the window by adjusting the trigger-amplitude control, and the other is to increase the waveform's slope by preamplification.

On some types of signal waveform it is sufficient to adjust the trigger-level control so that the counter triggers on the *steepest* portion of the waveform. On sine waves, for example, this point occurs at zero crossings, but on other waveforms it may occur elsewhere on the signal.

One final type of signal-related problem involves the case where successive cycles have varying amplitudes. You can position the trigger so that it satisfies some of the cycles—see Figs. 11(a) and 11(b)—but others fall outside of the hysteresis window. Again, the solution may be resetting the trigger control.

How Much Sensitivity?

It is possible that a system can have too much sensitivity. While that statement may seem heretical, there comes a point where the sensitivity is too great because it permits noise or distortion artifacts to cross the window limits. In some cases, therefore, our "fix" for certain problems is to reduce the sensitivity or insert an attenuator into the line. ■

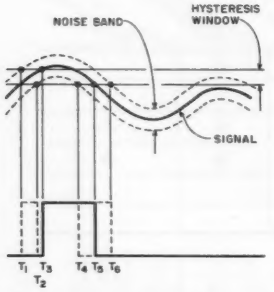

Fig. 10. Noise band along a shallow-slope waveform.

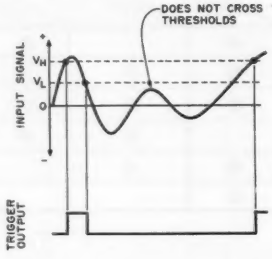

Fig. 11(a). Successive cycles with varying amplitudes.

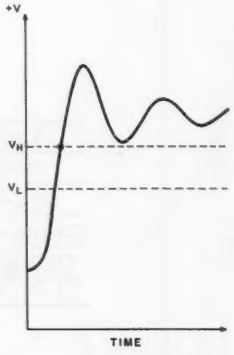

Fig. 11(b). Other cycles with varying amplitudes.

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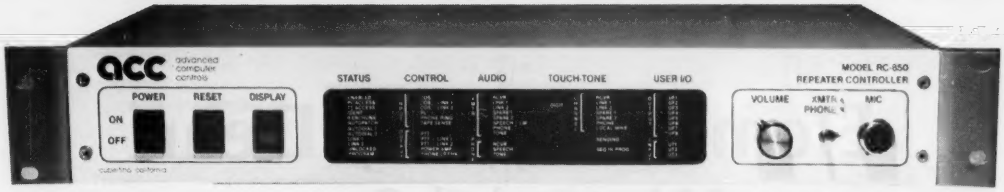

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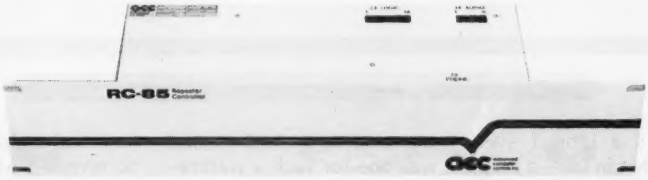

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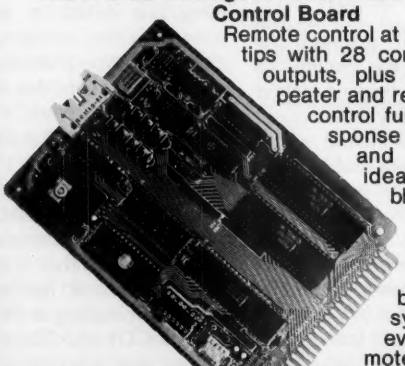

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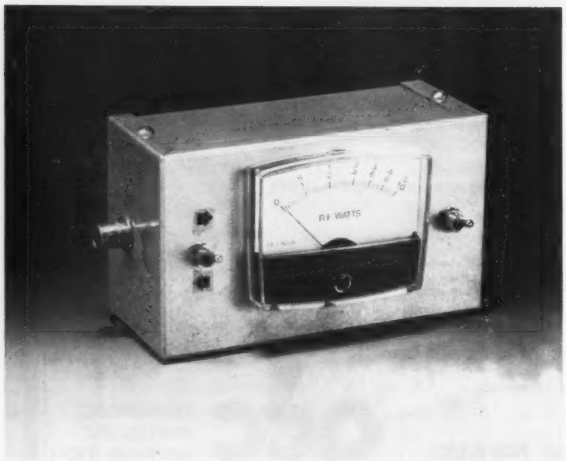
Here's a project everybody can use—a cheap, reliable wattmeter that can be used anywhere from 50 to 500 MHz. It uses an etched-line circuit for coupling and has two power ranges. Additionally, it can be calibrated to measure swr as well!

The idea for this project grew out of discussions the Split Rock ARA had back in 1980 concerning a possible club project. Among the many ideas kicked around was one for such a wattmeter, although at the time an unrealistic figure of $15.00 for the total cost was anticipated. As expected, the project never got off the ground.

I stuck with the concept and over the years tinkered with various designs. Somewhere in the past I had stumbled upon a circuit that used an etched transmission line and coupler, so a trip to the technical archives in the attic revealed what I needed. The big problem was that the etched line was nowhere near 50 Ohms! This wouldn't do at all. After all, what good is a 500-Ohm wattmeter?



Front view of wattmeter.

Additional research revealed that the dimensions of a 50-Ohm stripline etched on G-10 epoxy board were close to 1/10 inch in width, with any length usable. After confirming this with Steve Katz WB2WIK, I began carefully etching test boards in the darkroom using precision rulers and masking material cut with an X-acto® knife.

After about four prototypes, a board was produced which, when connected between two type BNC connectors (using the unetched side of the board as a ground plane), exhibited no reflected power on a Bird Model 43 wattmeter connected in series and terminated at 50 Ohms. Voila! I had done it. Now to the nuts and bolts of the circuit!

I should clarify any additional comments by saying that this unit is really a bi-directional coupler. As such, it can be used to measure swr or power—whichever you prefer. It samples a small amount of rf on the transmission line through a coupling line which is terminated in the middle. At either end, type 1N60 diodes are used to rectify this small sampled voltage. Add a few switches, pots, and a meter and that's it! Period.

As I just mentioned, rf energy traveling on the 50-Ohm section from input to output is sampled by the −30-dB coupler—sort of like winding a link coupling at HF frequencies. D1 and D2 can be almost any kind of point-contact diode, but the best choice would be a 1N60 due to the better performance characteristics at VHF/UHF.

The sampled, rectified dc voltage is then routed to R2 or R3 via SPDT switch S1. These two potentiometers set power ranges or can be used to set frequency ranges. Note that as with most wattmeters that use coupling lines, the degree of coupling

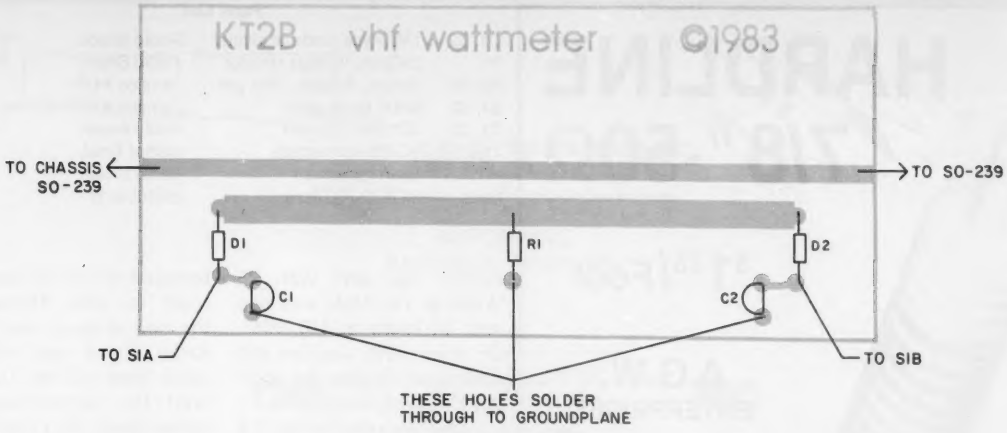


Fig. 1. PC-board overlay for parts.

rises with the frequency chosen and decreases with a lower frequency, so that different readings will be evident on different bands for the same power level measured.

Also note that while the actual power measurement and its relation to the meter scale is a function of a logarithm, the relation between decades of measurement is a linear function. This allows the use of one meter scale on any band. Power levels up to 500 Watts can be measured accurately with this unit—typically within 10% of a Bird 43—but I haven't tried anything higher. Teflon™ board would be a better choice for higher power levels.

R1 on the sampling line functions as a termination, and you may have to tinker with it a bit to determine coupling characteristics. I found a value of 27–33 Ohms to be fine. C1 and C2 function as rf bypass capacitors. The best way to mount the PC board is to suspend it between two connectors—either type SO-239 or BNC female. Use finger stock or braid to make a good connection from the ground lug to the backside of the PC board.

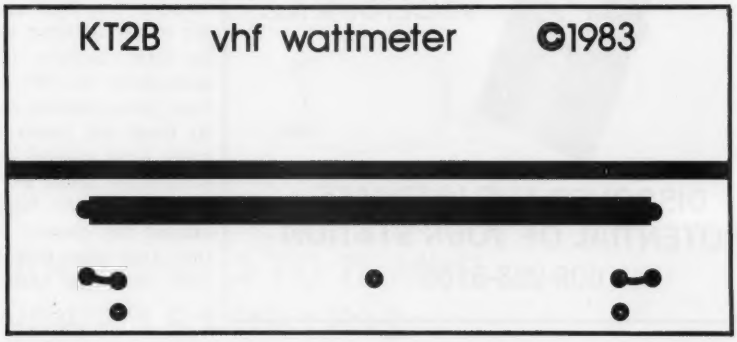


Fig. 2. Master art for PC board.

I would suggest installing the meter in the case *first* before doing anything else. A recommended unit would be the Radio Shack #270-1751, 50-μA movement. It's inexpensive and has a big scale that is easy to modify. Next, mount the two switches, S1 and S2, on either side of the meter face. Prepare the PC board with all components as shown in Fig. 1, along with appropriate lengths of wire to connect to each switch. Install the side connectors of your choice along with about 1" of braid or finger stock for the ground connection. Finally, install the completed PC board by suspending it between the center pins on the connectors and then soldering the center pins to the 50-Ohm etched line. Solder the braid to the back of the double-sided board.

Calibration can be achieved with use of a known, accurate bridge or wattmeter, such as a Bird Model 43 or similar unit. Set the unit up to the ranges you desire by adjusting the ten-turn pots, R2 and R3. For example, you may wish to measure the output of two

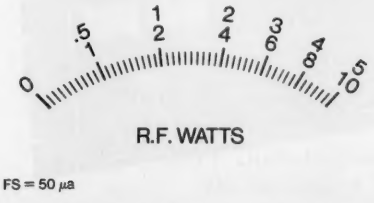


Fig. 3. Meter scale for Radio Shack 50-μA meter.

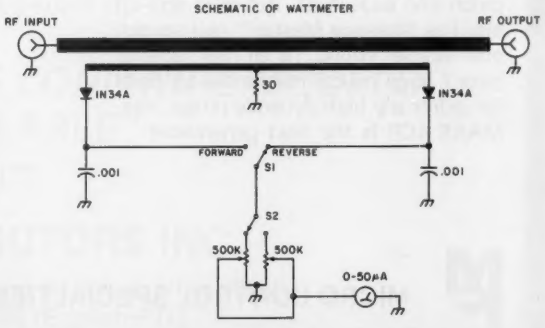


Fig. 4. Schematic.

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R1	33-Ohm, ¼-Watt resistor	Radio Shack	5 @ .39
R2, R3	15-turn, ¾-Watt, 500k pot	Jameco #43P	$1.19
S1, S2	SPDT Miniswitch	Jameco #JMT121	$1.49
C1, C2	.001 disc, 50 volts	Radio Shack	2 @ .39
J1, J2	SO-239 connectors	Nemal Elect.	$ .79
M1	50-μA movement	Radio Shack	$8.95
Case	LMB TF-780 case	(distributor)	$3.80
			$21.46

mobile rigs; one with 25 Watts at 146 MHz and one with 10 Watts at 440 MHz. Or, if you wish, you can add additional trimpots for additional ranges.

I have included in Fig. 3 a template for a wattmeter scale that can be used instead of the 50-μA scale on the meter. Remove the meter face carefully, using a screwdriver to pry it off. Next, using extreme care not to bend the meter movement, work a small knife or screwdriver under the metal scale on the unit. Pry gently around the corners until it pops free, then slide it out. Use this metal scale as a template to cut the supplied scale to size. Reinstalling the new scale is easy since Radio Shack uses double-sided tape on the face to hold the factory-supplied scales. Snap the cover back on and you're in business.

As was stated before, accuracy has been measured to within 10% or better of a Bird 43 on the desired frequency. If you want, you can remove the meter and remote it, leaving the coupling unit in its own box. This could be handy for mobile installations! If there is interest, I can supply etched, drilled, and plated PC boards for $10.00 each. ■

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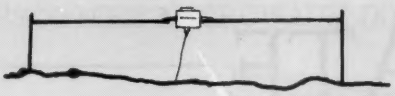

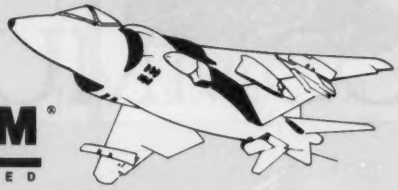

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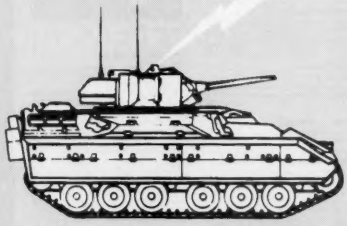

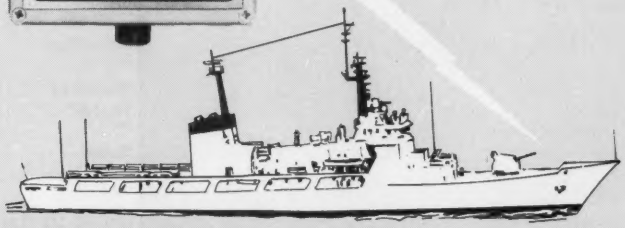

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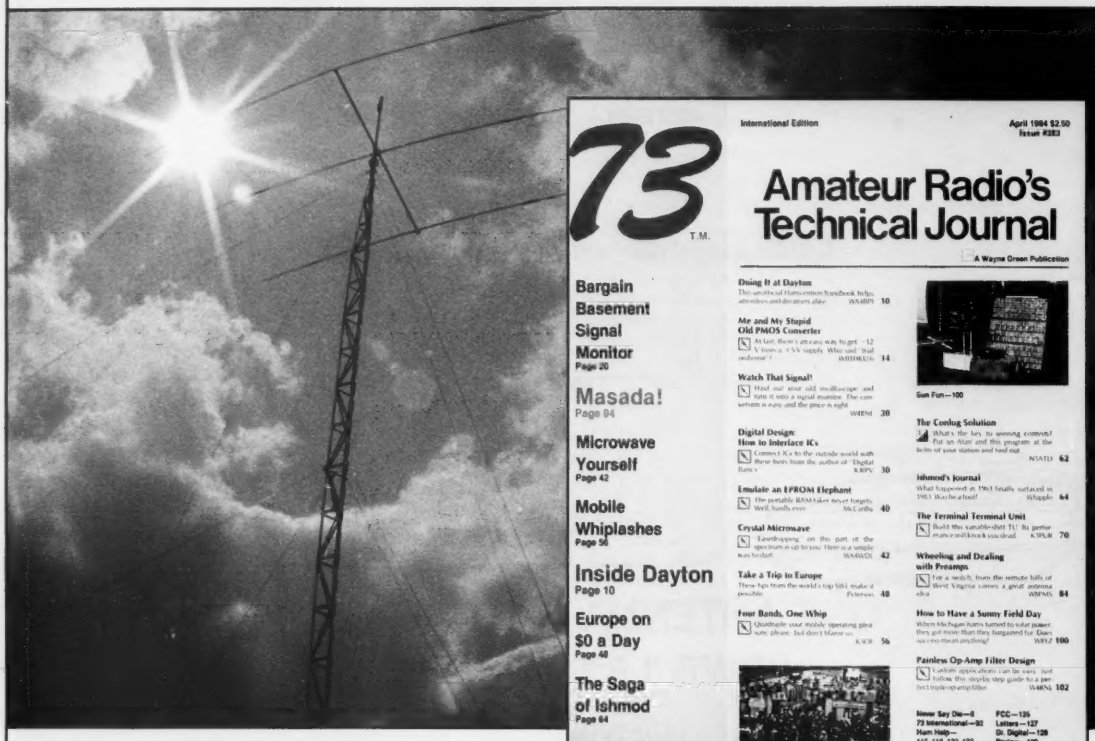

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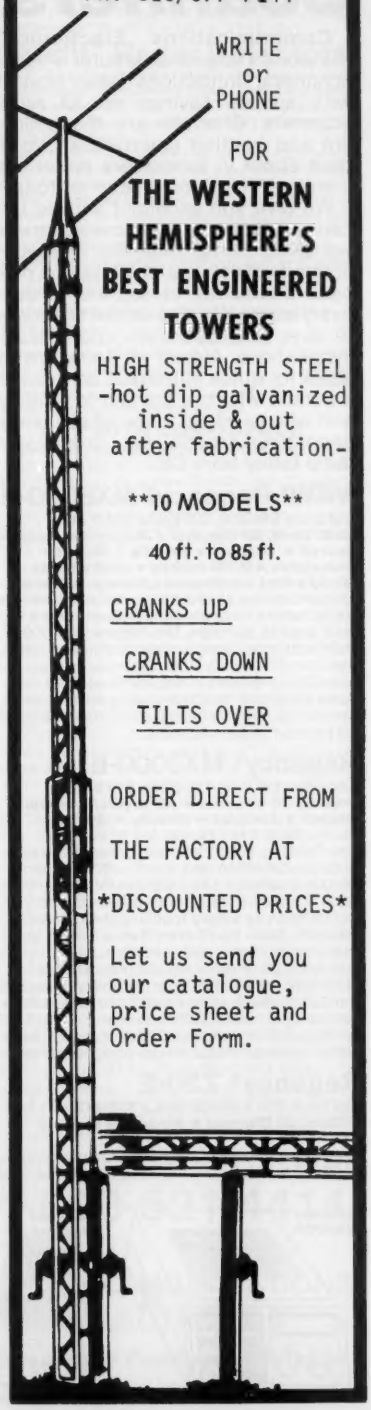

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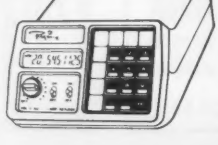

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NEW! uniden® Bearcat® Products

Communications Electronics,™ the world's largest distributor of radio scanners, is pleased to announce that *Bearcat* brand scanner radios have been acquired by Uniden Corporation of America. Because of this acquisition, Communications Electronics will now carry the complete line of Uniden *Bearcat* scanners, CB radios and Uniden *Bandit*™ radar detectors. To celebrate this acquisition, we have special pricing on the Uniden line of electronic products.

Bearcat® 300-E

List price $549.95/**CE price $339.00**

7-Band, 50 Channel • Service Search • No-crystal scanner • AM Aircraft and Public Service bands. • Priority Channel • AC/DC

Bands: 32-50, 118-136 AM, 144-174, 421-512 MHz.

The *Bearcat* 300 is the most advanced automatic scanning radio that has ever been offered to the public. The *Bearcat* 300 uses a bright green fluorescent digital display, so it's ideal for mobile applications. The *Bearcat* 300 now has these added features: Service Search, Display Intensity Control, Hold Search and Resume Search keys, Separate Band keys to permit lock-in/lock-out of any band for more efficient service search.

Bearcat® 20/20-E

List price $449.95/**CE price $269.00**

7-Band, 40 Channel • Crystalless • Searches AM Aircraft and Public Service bands • AC/DC Priority Channel • Direct Channel Access • Delay

Frequency range 32-50, 118-136 AM, 144-174, 420-512 MHz.

Find an easy chair. Turn on your *Bearcat* 20/20 and you're in an airplane cockpit. Listening to all the air-to-ground conversations. Maybe you'll pick up an exciting search and rescue mission on the Coast Guard channel. In a flash, you're back on the ground listening as news crews report a fast breaking story. Or hearing police and fire calls in your own neighborhood, in plenty of time so you can take precautions. You can even hear ham radio transmission, business phone calls and government intelligence agencies. Without leaving your easy chair. Because you've got a *Bearcat* 20/20 right beside it.

The *Bearcat* 20/20 monitors 40 frequencies from 7 bands, including aircraft. A two-position switch, located on the front panel, allows monitoring of 20 channels at a time.

Bearcat® 210XL-E

List price $349.95/**CE price $209.00**

6-Band, 18 Channel • Crystalless • AC/DC

Frequency range 32-50, 144-174, 421-512 MHz.

The *Bearcat* 210XL scanning radio is the second generation scanner that replaces the popular *Bearcat* 210 and 211. It has almost twice the scanning capacity of the *Bearcat* 210 with 18 channels plus dual scanning speeds and a bright green fluorescent display. Automatic search finds new frequencies. Features scan delay, single antenna, patented track tuning and more.

Bearcat® 260-E

List price $399.95/**CE price $249.00**

8-Band, 16 Channel • Priority • AC/DC

Frequency range 30-50, 138-174, 406-512 MHz.

Keep up with police and fire calls, ham radio operators and other transmission while you're on the road with a *Bearcat* 260 scanner. Designed with police and fire department cooperation, its unique, practical shape and special two-position mounting bracket makes hump mounted or under dash installation possible in any vehicle. The *Bearcat* 260 is so ruggedly built for mobile use that it meets military standard 810c, curve y for vibration rating. Incorporated in its rugged, all metal case is a specially positioned speaker delivering 3 watts of crisp, clear audio.

NEW! Bearcat® 201-E

List price $279.95/**CE price $179.00**

9-Band, 16 Channel • Crystalless • AC only Priority • Scan Delay • One Key Weather

Frequency range 30-50, 118-136 AM, 146-174, 420-512 MHz.

The *Bearcat* 201 performs any scanning function you could possibly want. With push button ease, you can program up to 16 channels for automatic monitoring. Push another button and search for new frequencies. There are no crystals to limit what you want to hear.

NEW! Bearcat® 180-E

List price $249.95/**CE price $149.00**

8-Band, 16 Channel • Priority • AC only

Frequency range: 30-50, 138-174, 406-512 MHz.

Police and fire calls. Ham radio transmissions. Business and government undercover operations. You can hear it all on a *Bearcat* 180 scanner radio. Imagine the thrill of hearing a major news event unfold even before the news organizations can report it. And the security of knowing what's happening in your neighborhood by hearing police and fire calls in time to take precautions. There's nothing like scanning to keep you in-the-know, and no better way to get scanner radio performance at a value price than with the *Bearcat* 180.

Bearcat® 100-E

The first no-crystal programmable handheld scanner.

List price $449.95/**CE price $234.00/*SPECIAL!***

8-Band, 16 Channel • Liquid Crystal Display Search • Limit • Hold • Lockout • AC/DC

Frequency range: 30-50, 138-174, 406-512 MHz.

The world's first no-crystal handheld scanner has compressed into a 3" x 7" x 1¼" case more scanning power than is found in many base or mobile scanners. The *Bearcat* 100 has a full 16 channels with frequency coverage that includes all public service bands (Low, High, UHF and "T" bands), the 2-Meter and 70 cm. Amateur bands, *plus* Military and Federal Government frequencies. It has chrome-plated keys for functions that are user controlled, such as lockout, manual and automatic scan. Even search is provided, both manual and automatic. Wow...what a scanner!

The *Bearcat* 100 produces audio power output of 300 milliwatts, is track-tuned and has selectivity of better than 50 dB down and sensitivity of 0.6 microvolts on VHF and 1.0 microvolts on UHF. Power consumption is kept extremely low by using a liquid crystal display and exclusive low power integrated circuits.

Included in our low CE price is a sturdy carrying case, earphone, battery charger/AC adapter, six AA ni-cad batteries and flexible antenna. The *Bearcat* 100 is in stock for quick shipment, so order your scanner today.

Bearcat® DX1000-E

List price $649.95/**CE price $489.00**

Frequency range 10 kHz to 30 MHz.

The *Bearcat* DX1000 shortwave radio makes tuning in London as easy as dialing a phone. It features PLL synthesized accuracy, two time zone 24-hour digital quartz clock and a built-in timer to wake you to your favorite shortwave station. It can be programmed to activate peripheral equipment like a tape recorder to record up to five different broadcasts, any frequency, any mode, while you are asleep or at work. It will receive AM, LSB, USB, CW and FM broadcasts.

There's never been an easier way to hear what the world has to say. With the *Bearcat* DX1000 shortwave receiver, you now have direct access to the world.

Uniden® PC22-E

List price $159.95/**CE price $99.00**

The *Uniden* PC22 is a 40 channel AM remote mobile CB radio. It's the answer for today's smaller cars which don't always provide adequate space for mounting. Since all the controls are on the microphone, you can stash the "guts" in the trunk. The microphone has up/down channel selector, digital display, TX/RX indicator and external speaker jack. Dimensions: 5¾" W x 7⅞" D x 1½" H. 13.8 VDC, positive or negative ground.

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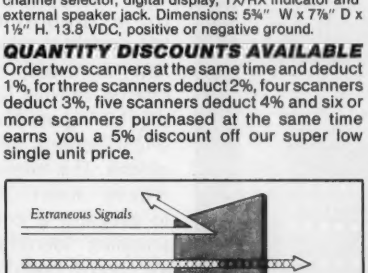
Order two scanners at the same time and deduct 1%, for three scanners deduct 2%, four scanners deduct 3%, five scanners deduct 4% and six or more scanners purchased at the same time earns you a 5% discount off our super low single unit price.



Both Bandit™ radar detectors feature E.D.I.T.,™ the Electronic Data Interference Terminator that edits-out false alarm signals.

Uniden® PC33-E

List price $59.95/**CE price $44.00**

The *Uniden* PC33 boasts a super-compact case and front-panel mike connector to fit comfortably in today's smaller cars. *Controls:* Power & Volume, Squelch; *Switches:* ANL. Other features of the PC33 include Graduated LED "S"/RF Meter, Digital channel indicator. Dimensions: 6" W x 6" D x 1⅞" H. ±13.8 VDC.

Uniden® PC55-E

List price $89.95/**CE price $59.00**

The full featured *Uniden* PC55 front-panel mike connector makes installation easier when space is a factor. It has ANL, PA-CB, Channel 9 and RF Gain switches. LED "S"/RF meter, TX lite, PA & external speaker jacks. Dimensions: 6" W x 6" D x 1⅞" H. ±13.8 VDC.

Bandit™ Radar Detectors

Now that everyone else has taken their best shot at radar detection, the Uniden Bandit™ has done them one better...with E.D.I.T.,™ the Electronic Data Interference Terminator that actually edits-out false alarm signals.

The Bandit 55, features a convenient brightness/dimmer control for comfortable day or night driving, plus a handy highway/city control for maximum flexibility wherever you drive. The Bandit 95 Remote, is a two-piece modular unit that lets you mount the long-range radar antenna behind the grill, out of view. The ultra-compact control unit can then be inconspicuously tucked under the dash or clipped to the visor. Order **Bandit 55-E** for $119.00 each or the **Bandit 95-E Remote** for $139.00 each.

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BC-WA-E Bearcat Weather Alert™ $35.00
A60-E Magnet mount mobile antenna $35.00
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Bob Pepper VE2AO
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Canada

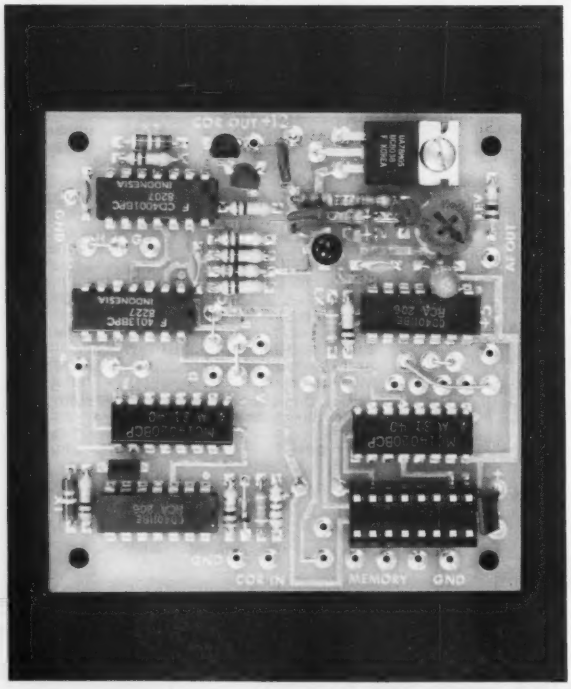
Perfect Timing

Proud of your repeater? Construct this multi-talented identifier and tell the world your who, what, and where.

Does the world really need a new repeater-identifier circuit or, for that matter, a new timer circuit? Why a new one when so many good designs abound?

Well, it was a combination of circumstances and specific needs which don't seem to be satisfied with the existing designs.

Bob's 2-meter repeater, VE2BG, shares a site with a commercial machine, one of several run by the operator. Said gentleman was advised by the DOC (Canada's version of the FCC) that all his transmitters (20 plus) must henceforth incorporate identifiers. Knowing that the commercial models would cost him a minimum of $500 each, he appealed to Bob for an amateur (read "low-cost") solution to his problem.



Identifier-timer board.

At about this point in time, VE2DWG developed a need for an identifier-timer for a proposed 10-GHz beacon. This would, every few minutes, send the beacon callsign plus a message giving the location and a QSL address for reception reports. This message would require about 200 diodes to program a conventional scanning identifier, requiring enough board acreage to grow corn as a sideline. This, plus the thought of installing a smaller number of diodes in 20 or more boards, was enough to convince us that programmable read-only memory (PROM) was the answer to both requirements.

The complication of building a PROM programmer seemed justified by the benefits to be gained. VE2DWG rashly volunteered to undertake this part of the project while VE2AO did the identifier-timer design. Enough said about this aspect of the project, except to note that as a consequence of this we are now able and willing to burn PROMs for those who like the design but don't want to go to the bother of haywiring together their own programmer.

The finished identifier-timer (the term seems to cry for shortening to something like *Identi-Timer*) uses six CMOS chips, a 256×4 (1K) bipolar PROM, a monolithic voltage regulator, and four transistors on a board three inches square to generate CW messages up to 256 bits in length. The addition of one more chip can increase this to 512 bits. Strapping options allow a choice of various timing options or

use as an identifier only. If your junk box is as bare as ours (at least when it comes to the particular parts that are necessary) and you end up having to buy all the components, the total cost should not exceed 25 dollars.

Construction

Parts placement is shown in Fig. 4. All resistors are ¼ Watt and are mounted flat to the board except for the two 470-Ohm resistors on the base of Q1; these are mounted on end, transistor-radio style. The 20k tone-level potentiometer is a Helitrim Model 91; anything of the same approximate size and lead placement will work. The lead on the voltage regulator should be bent at right angles before mounting, allowing you to secure it with a #4 screw and nut through a hole in the board for this purpose.

All ICs except the PROM were soldered in place on the 20 or so boards manufactured; no failure occurred which would have made the messy job of removal necessary. It hardly seems right to have to use IC sockets costing more than the chips that go in them, but this does necessitate buying good quality chips with minimal failure rates; the choice is up to the builder. A 16-pin DIP socket was provided for the PROM since callsigns do change.

Circuit Description

The unit is divided into two functional blocks: the identifier and the timer circuit. The identifier will be described first, since it is the less complicated of the two. All integrated circuits (except the PROM itself and the on-board voltage regulator) are CD4XXXB series CMOS.

The Identifier Circuit

The basic idea of the identifier is centered around a 256 × 4-bit programmable read-only memory containing the previously-entered bit sequence, in 1s and 0s, that represents the message to be sent in Morse. The address lines of the PROM are scanned in sequence by a binary counter at the desired rate, outputting the stored bits which are used to key an audio oscillator which is fed to the repeater audio line.

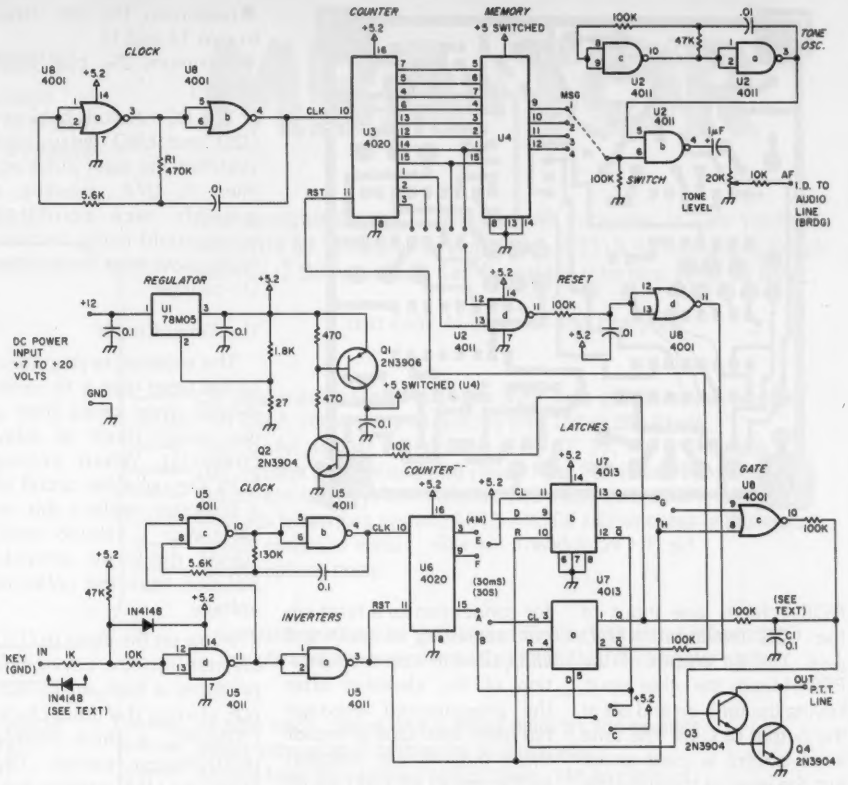


Fig. 1. Identifier-timer schematic diagram.

The counter is driven by an astable multivibrator clock which runs at a rate which is 16 times faster than the shortest element bit length, equivalent to a dot. For a speed of 10 words per minute, the element length is about 120 milliseconds; this means that the clock bits are about 75 milliseconds, an operating frequency of 133 Hz. The value of R1 can be varied to produce the desired speed; halving the value will double the speed.

A word about the feedback resistor used on this clock and the timer clock: Normally it should have a value of at least two times the R1 value. However, the very fast rise time of the B series CMOS (on the order of nanoseconds) caused erratic clocking of the CD4020 counters, with strange-sounding results in the CW output or inexact time intervals. Reducing the value of this resistor to 5600 Ohms cured the problem when nothing else availed. The problem was not encountered on the U2A/U2C tone oscillator, so the conventional value was used here.

The clock drives U3, a 14-stage CD4020 binary ripple counter. The Q4 to Q11 outputs of the counter (divide by 16 to divide by 2048) are connected to the address lines of the PROM, addressing memory locations 000 to 255 (00 to FF hex) in sequence. At each step, the PROM outputs four bits on its 9/10/11/12 pins. Only one of these bits is used in a memory cycle, normally bit 1, but any one of the four can be selected by strapping on the board. Alternative messages can be programmed in bits 2 to 4 locations, or a continuation of the message in the 256 bit 1 locations, using the optional memory switch.

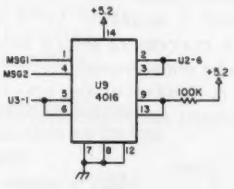


Fig. 2. Optional-message switch.

A tone oscillator, U2A/U2C, identical to the counter clock except for the operating frequency (and the use of NANDs in place of

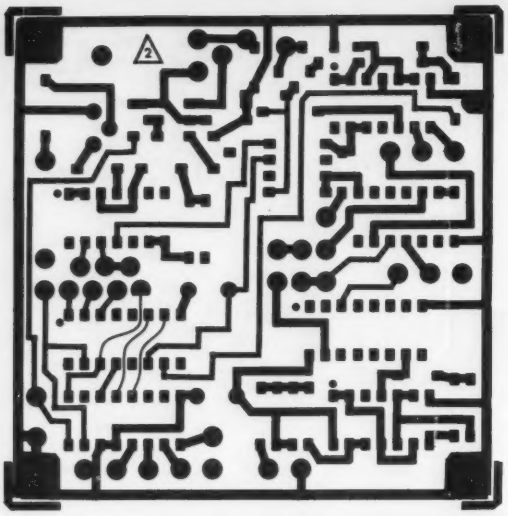


Fig. 3. Circuit board, foil side.

NORs), feeds one input of the U2B two-input NAND gate. The bit output of the PROM feeds the other input, keying the tone on and off at the output of U2B. The tone level control is used to adjust the level of the signal into the 10k series resistor which is bridged on the repeater audio line. Sufficient level is available to cover the majority of setups likely to be encountered.

A number of the counter outputs are made available for connection to a reset circuit consisting of U2D and U8D, used to stop the operation of the identifier after the programmed message has been sent. One or two of these outputs are strapped to the inputs of U2D as required, the two inputs being bridged together if only one output is used. The selectable message lengths are:

- maximum 64 bits: strap to output pin 14.
- maximum 128 bits: strap to pin 15.
- maximum 192 bits: strap to pins 14 and 15.
- maximum 256 bits: strap to pin 1.

The RC network between U2D and U8D delays and stretches the reset pulse applied to U7A, avoiding a possible race condition which could occur because of the slow reset time of the U3 counter.

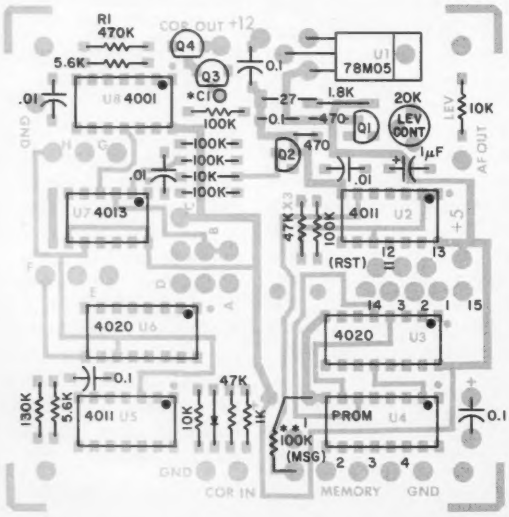


*Fig. 4. Circuit board, component side. *C1, 0.1 uF if required. **Tack-solder 100K resistor from "memory" common to ground, on front or rear of board.*

The Timer Circuit

The external keying input to the timer uses a 1k series resistor when keyed from a dry circuit (such as relay contacts). When keying from the collector circuit of a transistor, replace this resistor with a 1N4148 small signal diode to provide isolation from the collector voltage.

A low on the input to U5D inverter from the keying line produces a high on its output, starting the timer-clock, U5B/U5C, a third astable multivibrator circuit. The following U5A inverter puts a low on the U6 4020 counter reset line and one input of U8C NOR gate. This low enables the counter and is inverted by U8C to turn on the Q3/Q4 Darlington pair, keying the PTT line to ground. Q3/Q4 are capable of driving external loads up to 12 volts, 50 mA. Relay coils should have a parallel reverse protection diode to prevent voltage spikes from damaging the transistors.

The counter clock has a normal pulse width of 15 milliseconds. The three counter outputs provide timed periods of 30 milliseconds, 30 seconds, and 4 minutes, which are the intervals required for the following modes of operation:

- Mode 1 (Straps A, C, E, G): Provides COR timeout of 4 minutes, ID after 30 seconds; will continue to identify every 60 seconds even after timeout, as an indication that the keying input is still seized.
- Mode 2 (Straps A, C, E, H): Will ID after 30 seconds and every 60 seconds thereafter; no timeout function.
- Mode 3 (Straps A, D, E, G): Same as mode 1 except that ID does not continue after timeout.
- Mode 4 (Straps B, C, F, H): Identifies after each transmission, no timeout function.
- Mode 5 (Straps B, C, E, H): Identifies after a transmission, but only if the keying input has been seized for a minimum of 4 minutes; no timeout function.

U7A and U7B D-type flip-flops act as latches, storing the state of the counter outputs for control of the identifier and the PTT line. When strap G is inserted, U7B Q output provides the timeout function via the U8C two-input NOR gate. Strap H is used when timeout is not required, relegating U8C to the function of an inverter for the keyed output of U5A.

The U7B $\overline{Q}$ output is used (1) to disable the ID cycle on timeout (option 3), (2) to provide an ID after each transmission (option 4), or (3) to provide an ID after 4 minutes (option 5), by clocking the D (data) input of U7A.

U7A's Q output is tied to the base of Q2, turning on +5 volts to power the PROM during ID, and to the base of Q3, keying the PTT line while the ID is being sent. The $\overline{Q}$ output controls the ID counter, starting the address count, and stopping it when reset occurs via U2D/U8D. Time-delay capacitor C1, 0.1 uF, should be equipped when options 4 or 5 are used.

When the U5A input is unkeyed, the input(s) of U8C go from low to high, removing the Q3/Q4 ground from the PTT output. The same change of state resets the U6 timer counter and the U7B timeout latch and stops the U5 timer clock.

Voltage Regulator Circuit

U1 is a ½-Ampere, 5-volt regulator chip. Heat-sinking of the package is not neces-

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MAIN MENU SCREEN

```
                    hh:mm:ss

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 U. AUTO AMTOR
 X. AUTO CALL
 C. COMMANDS
 O. OPTIONS
```

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- CW receive and transmit at 5 to 99 wpm, auto speed track on receive.
- 7 bit ASCII, receive and transmit at 110, 150 or 300 bauds.
- 5 bit Baudot, receive and transmit at 60, 67, 75, 100 or 132 wpm.
- TOR, receive and transmit ARQ (Mode A) or FEC (Mode B) and listen.
- Beacon and WRU system, includes QRG check before XMT, won't QRM.
- Message forwarding system, AUTO-AMTOR still functions in this mode.
- Selects command menu.
- Selects options menu.

+ Complete precompose split-screen display with status information.
+ Complete printer control including SELCALL/WRU printer control.

OPTIONS MENU SCREEN

```
                    hh:mm:ss
 I. CALLSIGN        ??????
 S. SELCALL         ????
 T. ARQ TIMEOUT       30
 U. USOS              ON
 M. MORSE FILL (BT)   OFF
 R. RTTY SYNC (NUL)   OFF
 A. AUDIO FEEDBACK    OFF
 C. AUTO CR           ON
 L. AUTO LF           ON
 B. BEACON RECORD     OFF
 W. WRAP-AROUND       ON
 K. CW BREAK-IN       OFF
 O. OUTPUT MODE       WORD
```

- 24-hour clock, shows time in hours, minutes and seconds.
- Allows entry of your callsign for auto operations.
- Derived from your callsign automatically, can be changed.
- Sets ARQ phasing calls from 1 to 99 seconds.
- Unshift on space, toggles on or off.
- Transmits Morse idle character during breaks in KBD activity.
- Transmits RTTY idle character during breaks in KBD activity.
- Produces click in monitor audio when any key is pressed.
- Sends carriage return the first space after 65 characters.
- Sends a line feed after each carriage return.
- Allows the beacon to be recorded to the QSO buffer for logging.
- Sends CR/LF if there is a space in the last 5 positions on the line.
- Automatic transmit/receive switching during QSO.
- Transmit in word mode (text sent on space) or character mode.

COMMAND MENU SCREEN

```
                    hh:mm:ss

 L. LOAD
 E. EDIT
 M. MOVE
 S. SAVE
 X. SET XMT BUFFER SIZE
 C. SET COLOR
 T. SET TIME
```

+ Break-in buffer on all modes, toggle QSO buffer on or off.
+ CW speed lock and Farnsworth low-speed CW.
+ 10 soft-partitioned™ message buffers plus direct from disk or tape.

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- Allows transmission of QSO buffer without disk or cassette systems.
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- Set the transmit pre-type buffer to any size you like.
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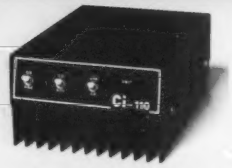

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sary since the standing drain of the CMOS circuitry is very low, about 8 mA, and the heavier load of the PROM is short term since it is turned off when not required. This feature allows use of the timer/identifier even with low-power-drain repeaters operating from solar cells, batteries, etc. The output of the regulator is set at 5.2 volts by bringing the common lead slightly above ground with a 27-Ohm resistor. This offsets the voltage drop of about 0.2 volts through the PROM switch and, although not strictly necessary, was added because of the simplicity of doing so. The remainder of the circuit runs on the full 5.2-volt output. The input to the board can be anything in the range of 7 to 20 volts positive.

Parts List

Integrated Circuits	**Resistors (¼ Watt)**
U1 78M05	1 27 Ohms
U2, 5 CD4011B	2 470 Ohms
U3, 6 CD4020B	1 1k
U4 PROM (see text)	1 1.8k
U7 CD4013B	2 5.6k
U8 CD4001B	3 10k
Transistors	2 47k*
Q1 2N3906 PNP	5 100k
Q2, 3, 4, 2N3904 NPN	1 130k*
	1 470k*
	1 20k PCB mount trimpot
Capacitors	**Diodes**
3 0.01 uF	1 1N4148
5 0.1 uF	(or 2—see text)
1 1.0 uF	
Fig. 2 Message Switch	**Miscellaneous**
U9 CD4016	1 16-pin DIP
1 100k resistor	socket (PROM)

* Values shown are nominal ones for clock-circuit frequencies specified in text.

Optional Message Switch

This feature permits messages up to 512 bits in length to be sent by switching the PROM output to an alternative track after the first 256 bits have been transmitted. The address scan of the counter is recycled for the second track. The switch is mounted on a piggyback board over the main PC board and may be made of perfboard or any other suitable material. A PC board is not really necessary because of the simplicity of the circuit; six connections to the main board are required.

A CD4016 quad analog switch, of which three sections are used, is the base of the message switch. The MSG1 and MSG2 outputs of the PROM (or any two as selected) are routed through switches 1 and 2. Switch 1 is normally closed via a high on U9-13 from the +5-volt line through 100k. Switches 2 and 3 are open because of a low condition on U9-5 and U9-6. MSG1 is routed to the output.

When a count of 256 is reached, U3-1 goes high, turning on switches 2 and 3. MSG2 is now routed to the output. The closure of switch 3 to ground pulls the switch 1 control line low, removing MSG1 from the output. The address lines to the PROM recycle through all the 256 addresses or less, depending on the reset strapping, sending the second portion of the message. The reset-strapping options for messages over 256 bits long are:

- maximum 320 bits: strap to output pins 1 and 14.
- maximum 384 bits: strap to pins 1 and 15.
- maximum 512 bits: strap to pin 2.

The circuit could presumably be extended on the same principle for message lengths up to the full 1024-bit capacity of the PROM; however, few applications would require messages of this length. The average repeater ID requires considerably less than 256 bits.

Programming Considerations

The circuit as designed uses tri-state 256×4 PROMs such as the TI 24S10, Signectics 82S129, National 74S287, or their equivalents. This avoids the use of external pull-up resistors required with open-collector-output versions. The TI 24S10, which we used, requires that you burn those bits which are zeros in the message; that is, you burn the spaces and skip the dots and dashes. Other chips may require the opposite condition to this and it is best that you check the data sheet for the one you are using before proceeding to program it.

A delay of three or four bits should be programmed as spaces at the beginning of the message to allow the PROM voltage and the counter to stabilize, avoiding missing bits in the output. You will have to burn spaces from the last bit of the message to 1 bit beyond the reset point selected (at least with the TI chip).

To ease the construction work and programming, the authors are offering as a package a double-sided, plated-through circuit board plus a PROM programmed with the message of your choice, for $10.00. If you have any queries on the circuit, we would be glad to try to answer them as best we can. An SASE (US postage OK) would, as always, be appreciated. ■

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By the way, we are sorry to announce that Tang has been executed. Our spy (Tang) told us that the ICOM IC2A/IC2AT was gone. WRONG!! Unlike Tang the IC2A series is alive and well, along with the new IC02A series. Call for prices.

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Quick Qwip Conversion Fax

Seeing is believing. A few dollars and a weekend will turn this surplus unit into a reasonable facsimile.

A relatively new piece of fax gear has reached the surplus market in large numbers. The Qwip® 1000 is a solid-state send/receive unit manufactured in the mid to late 1970s. Circuitry is virtually all IC chips, and common ones at that. These model 1000 machines are available currently because they were recently replaced with the newer and more sophisticated model 1200. The units look similar, but the electrical circuitry is vastly different.

The scope of this article is introductory. These units are certainly worthy of conversion for fax work, and since it is likely that the newer models will also show up as surplus in the near future, I'll try to cover the differences as well as the operational characteristics.

The Qwip units were designed originally for business office use and are easy to operate. The basic design includes a telephone handset cradle, called a coupler, for sending or receiving over long-distance telephone lines. In this way, contracts, manuals, and other documents may be transmitted immediately from one business office to another. At the sending unit, a document is placed on the drum and the selector switch over the drum is placed in the send mode. Each machine has a two-position send switch. In normal use, compatible with most other fax machines, the 6-minute send position is used. The alternate position is for a 4-minute send duration and should be used only with other Qwip machines set for that duration. As soon as the send button is pressed, the unit begins transmitting its image to another unit. That's all there is to sending.

On the receive end, the operator places an 8″×10″ piece of fax paper on the drum and sets the selector switch to receive. A one-way clutch knob located on the right side of the roller drum opens a lock rail on the drum. After the paper edge is placed in the roller clamp rail, the clamp is closed and the paper is secured to the drum. The other edge of the paper remains free, but may be taped down if desired. By prearrangement, a 6-minute or 4-minute speed is then selected to match that of the sending unit. Then the telephone handset is placed on the cradle.

In the receive mode, the drum and stylus do not operate until the unit senses the send signal of 2400 Hz. A 566 tone decoder then activates the drum circuit. The receive unit, once started, will continue to print until the read/write assembly traverses the drum, the phone line is cut off, or the unit is switched off.

Qwip units will not send or receive if the drum com-

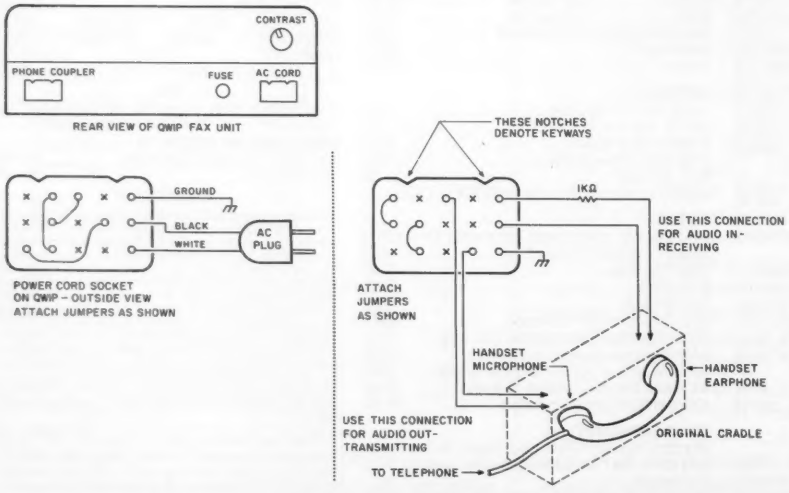


Fig. 1. Wiring connections for Qwip 1000/1200.

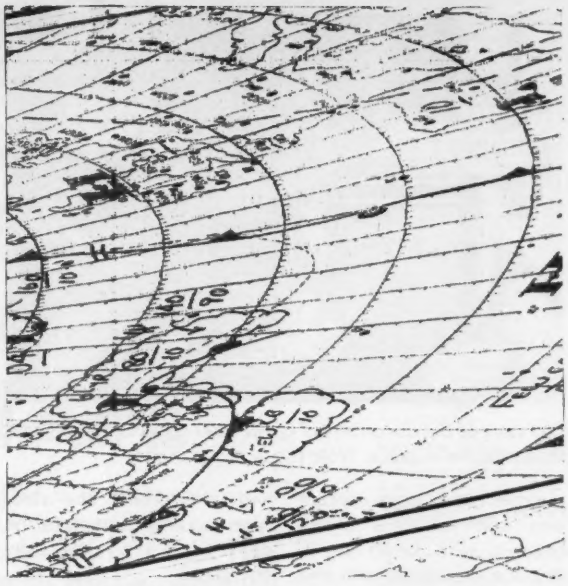
partment lid is left open. A reed switch activated by a magnet in the lid handle will idle the drum and circuits. At the end of normal operation, or in case of failure of some sort, a 555 timer chip buzzer will sound.

So much for normal operation. There are a couple of other minor controls and they are self-explanatory. As with any other piece of surplus, the Qwip units do not come complete with peripherals, namely, the ac patch cord and phone cradle, but for amateur radio or weather fax use this is no disadvantage.

The best way to ensure you'll get a working Qwip from surplus is to buy several and use 2 or 3 bad ones to make one good one. Reasons: For one thing, manuals and schematics are almost nonexistent. Also, many units have had holes drilled through crucial parts, wrecking each unit from a repair standpoint. Fortunately, the folks who drilled these never hit the same spot twice from unit to unit. In my case, I bought 2 units; one had holes in the circuit board, but the other only had a wrecked wiring harness. With one intact board and one good harness I soon had a like-new unit. I should mention that these units will require a good cleaning before they are fit to use.

The Qwip 1000s now available were brought in for repair but the dealers just gave out new 1200s in exchange. Any Qwip 1000 is bound to need repair. Most Qwips are sold with complaint cards still attached. One of mine read "noisy motor." The problem turned out to be a bent fan blade, remedied with an appropriate twist. A damaged wiring harness was the only other problem I uncovered. I recommend buying several units though, for another reason: The plug and socket connectors for the ac patch cord and phone cradle are interchangeable, and by robbing several Qwip units you can get a complete set of male/female connectors. As small as the Qwip units are, there is room to mount other plugs, if needed.

Fig. 1 shows the necessary plug/socket wiring. To make a Qwip unit workable, the jumpers must be added for normal use. (The view is of the outside of the Qwip.) This connection diagram will work for any model 1000 or 1200. The contacts identified as circles are used. The X contacts are unused. In tracing out the wiring harness to these sockets, you may find wires that go to these X pins, but do nothing. They may be removed or ignored.



A fax copy on HF (8.08 MHz) with bfo tuned to 2400 Hz. 120 rpm; a Qwip 1000 conversion.

Mechanical operation of the Qwip units is limited and there's not much to go wrong. The end bearings of the drum shaft should be inspected, lubricated, and if necessary, replaced. The stylus relay on top of the drum operates a copper stylus arm which holds a steel wire. Should the wire get broken or used up, it is very easy to repair. Just

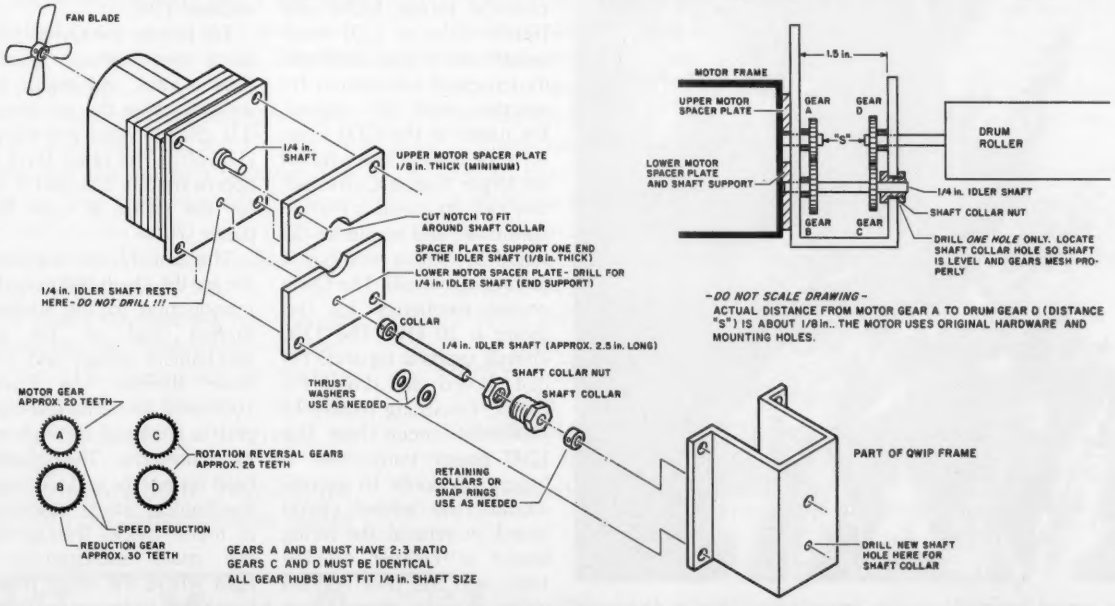
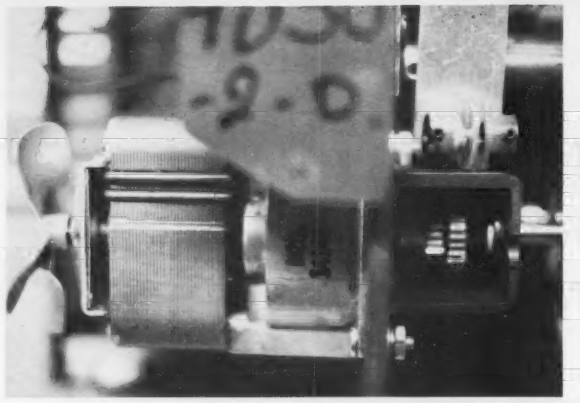
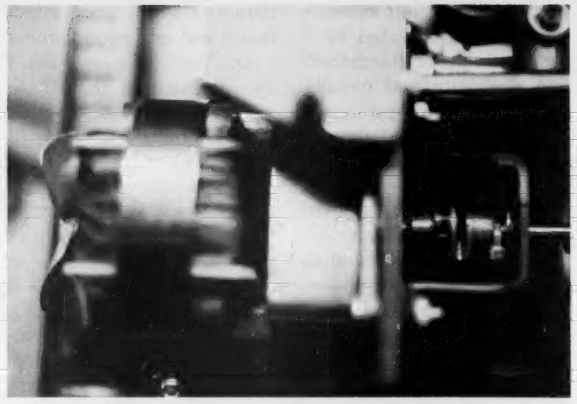

FAN BLADE
1/4 in. SHAFT
UPPER MOTOR SPACER PLATE 1/8 in. THICK (MINIMUM)
CUT NOTCH TO FIT AROUND SHAFT COLLAR
SPACER PLATES SUPPORT ONE END OF THE IDLER SHAFT (1/8 in. THICK)
LOWER MOTOR SPACER PLATE - DRILL FOR 1/4 in. IDLER SHAFT (END SUPPORT)
1/4 in. IDLER SHAFT RESTS HERE - DO NOT DRILL !!!
COLLAR
1/4 in. IDLER SHAFT (APPROX. 2.5 in. LONG)
SHAFT COLLAR NUT
SHAFT COLLAR
THRUST WASHERS USE AS NEEDED
MOTOR GEAR APPROX. 20 TEETH
A
B
C
D
ROTATION REVERSAL GEARS APPROX. 26 TEETH
SPEED REDUCTION
REDUCTION GEAR APPROX. 30 TEETH
GEARS A AND B MUST HAVE 2:3 RATIO
GEARS C AND D MUST BE IDENTICAL
ALL GEAR HUBS MUST FIT 1/4 in. SHAFT SIZE
RETAINING COLLARS OR SNAP RINGS USE AS NEEDED
PART OF QWIP FRAME
DRILL NEW SHAFT HOLE HERE FOR SHAFT COLLAR
1.5 in.
MOTOR FRAME
UPPER MOTOR SPACER PLATE
GEAR A
GEAR D
"S"
DRUM ROLLER
LOWER MOTOR SPACER PLATE AND SHAFT SUPPORT
1/4 in. IDLER SHAFT
SHAFT COLLAR NUT
GEAR B
GEAR C
DRILL ONE HOLE ONLY. LOCATE SHAFT COLLAR HOLE SO SHAFT IS LEVEL AND GEARS MESH PROPERLY
- DO NOT SCALE DRAWING -
ACTUAL DISTANCE FROM MOTOR GEAR A TO DRUM GEAR D (DISTANCE "S") IS ABOUT 1/8 in.. THE MOTOR USES ORIGINAL HARDWARE AND MOUNTING HOLES.

Fig. 2. Details for the 120-rpm speed conversion for the Qwip 1000.



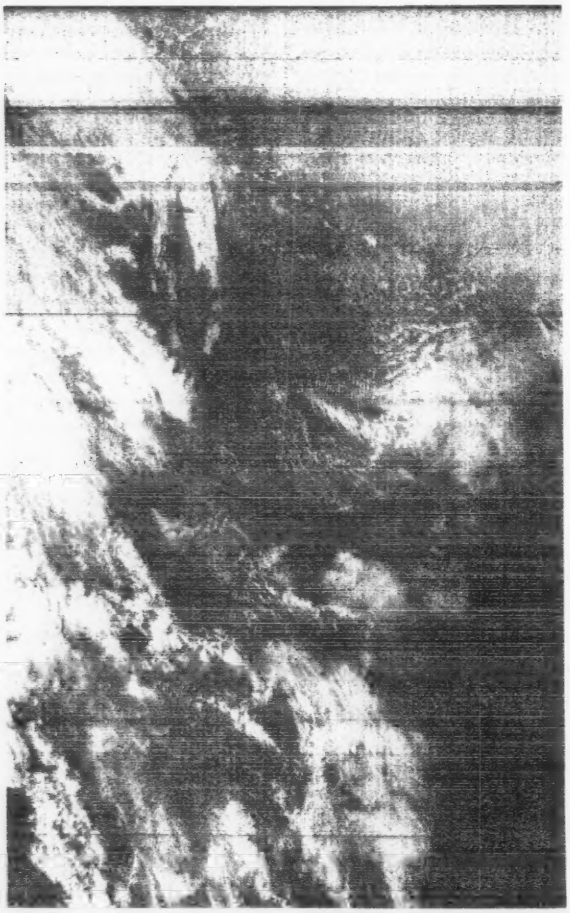
Top view of the unconverted Qwip 1000 showing the original shaft coupler in place. Note the bent fan blade.



Top view of the converted Qwip 1000 and the original coupler that was removed. The motor will mount either right side up or, as here, inverted.

remove the copper contact arm and solder a bristle from a wire brush to it. Replace the copper arm and manually operate the relay to check for good contact with the drum. The steel wire should not contact the drum when the relay is de-energized.

The drum speed of the standard Qwip unit is 180 rpm, which is compatible with many other office-style fax machines. This speed is common on amateur radio frequencies, and once a Qwip unit is working properly it should be easy to interface it with radio gear for sending or receiving. Qwip paper is good for letters, callsigns, etc., but I recommend photocopy paper (Xerox®, etc.) for photographs.



An actual weather satellite image taken from a converted Qwip. Lake Winnipeg is in the upper left-hand corner.

The Qwip 1000 is mechanically similar to the 1200, but electrically they have little in common. The Qwip 1000 motor, for example, is a basic ac-synchronous mechanical motor, bulky and heavier than its 1200 counterpart, and it lends itself easily to speed conversion for weather work. By contrast, the motor in the 1200 series is a dc-driven servo-motor no larger than a C-size battery cell. Its speed is crystal-controlled and would be difficult to adjust without a technical manual. The Qwip crystal frequency for this motor is 20 kHz. The 1200 chassis sports a separate circuit board to drive the motor, consisting mostly of 7400-series circuit chips. The 1200 power transformer is bigger, no doubt to accommodate the added circuit board. In general, the wiring layout is cleaner on the 1200, and the pots contain more glue to secure their positions.

The main circuit boards look similar in both the 1000 and 1200, but the parts layouts change once you get past the power-supply diodes. None of the adjustment pots is captioned or identified. The few pots I could decipher were not located near the chip they control. The 1200 also has a switch labeled Compatibility Selector. For this, the circuit board contains an extra relay. In operation, the switch makes an LED flash for compatibility with a Qwip 1000 or burn steadily when it is to be used with another 1200.

For power, the Qwips produce two voltage levels. One is plus and minus 15 volts to drive the op amps, TTL chips (5 volts), and relays (12 volts). The other level is approximately 200–300 V dc for the stylus to burn the paper.

The one factor responsible for the Qwip 1000's early introduction to the surplus market had to be its mechanical design and the flaws therein. The Qwip 1000 used the same low-cost plastic material throughout its mainframe. This plastic held up poorly and suffered mechanical stress resulting in many cracks throughout the main subassembly—right where the drum roller functions, to be exact. Thus, the model 1000 series prob-

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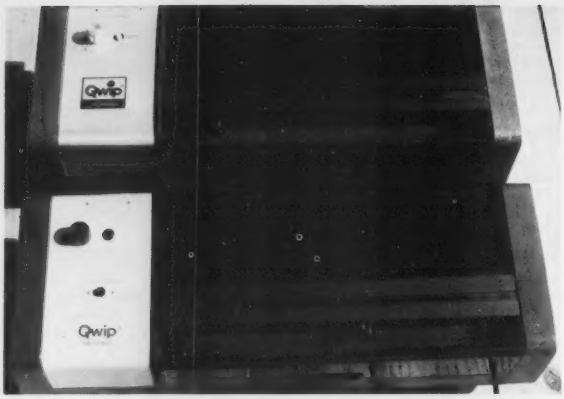
ably has flaws in the worst possible places for amateur fax work. Nor does the plastic material mend easily with glue—another reason for purchasing more than one.

The 1200 overcame this problem by changing the subframe material to a much stouter fiberglass. Along with an improved electrical design, the 1200 hosts a lighter-weight roller. Its bearings have less drag. The Qwip 1000 used a slotted roller with a cutting blade mounted in the read/write head. The 1200 model uses a smoother roller and no cutter, indicating that an improved phasing circuit has been added. Neither type of roller is made of electrically-conductive material. Grounding is achieved through a set of mechanical fingers which rest against the roller and are located at the very bottom of the machine. Partial conductivity can be made through the retaining clamp built into the drum roller, but this is not a good conductive path for the stylus. The 1200 is not a copper/steel assembly as used in the 1000 series; the 1200 stylus is a wire-filled fiber.



The Qwip 1000 (top) and the nearly-identical Qwip 1200.

Considering that the Qwip units cost several hundred dollars new and are going for fifteen to thirty now, the mechanical drive system alone is worth the asking price. The circuit boards are a bonanza for ICs and tantalum capacitors. Parts and component values are completely standard.

Like most fax machines made commercially, the Qwip machines easily lend themselves to modification. Fig. 2 shows a mechanical gear-reduction assembly that can be used for changing the drum speed to 120 rpm for weather fax operation. Although the gears are shown spread out, the actual assembly fits into an area narrower than a Band-Aid™ box. The drawing gives location details of the parts needed. Using the arrangement pictured there, the conversion requires only one *very carefully* placed hole to be drilled in the Qwip sub-chassis just under the drum-roller shaft hole. (This is another good reason to own more than one Qwip—practice.) Originally, the motor shaft was directly coupled to the drum shaft and this coupling can be restored if 180-rpm operation is ever desired again. The original motor mounting holes are preserved; the motor is just moved back a wee bit. This conversion requires some degree of care and patience, but is not difficult. The four gears necessary are all that need to be purchased. The other parts are fashioned from scrap.

About the gears: I have labeled them gears A, B, C, and D. A and B do the speed reduction but leave the quarter-inch shaft turning the wrong direction. Gears C and D are for direction reversal. They wouldn't be necessary except that the drum-roller shaft rides on a one-way bearing located at the right side of the Qwip subframe. As it turns out, the gears needed fit just fine with little effort.

Gear A is a Boston gear #H3220 and is the only gear that comes with a ¼-inch hub diameter. All others require hub bushings and they are reasonably priced. Gear B is a Boston gear #H3230. Gears C and D are identical. You might try Boston #3226, although you may need to go up or down one size in order to reach a proper fit. I did the whole conversion in one day, making it up as I went along. Once finished, conversion to or from 180 rpm takes just a few minutes.

In HF work where the transmit tone is 400 Hz, try using a bfo pitch tuned to 2400 Hz to activate the drum-rotation circuit. The bfo tone has almost no effect on picture quality. Signals are generally available on 8,080 and 10,865 MHz and produce good results on a Qwip.

The Qwip units will print from a whisper. It is all too easy to overdrive the input to the point where the drum will stop turning because the tone decoder is overloaded. A 100k trimpot is recommended for the input line. It should cure most troubles, although internal adjustments may also be required.

Judging by the many applications for which the Qwip components may be used and the very low price tag, the Qwip 1000 or 1200 could easily rank with the ARC-5 units as the surplus buys of the century. ■

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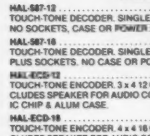

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No-Etch Circuit Boards

Produce quality PCs with N6JH's cut-and-pry technique.

One of the more persistently recurring problems with home-brew projects is making printed circuit boards. Amateurs have used many approaches to this dilemma, and numerous articles describe schemes ranging from the most sophisticated photographic and etching techniques to the crudest methods of drawing the traces directly on a board. But one of the more overlooked ways to make prototype boards is to bypass entirely the printing and etching and directly cut the conductive traces by hand.

Many of the boards used by amateurs, especially for high-frequency work, are simple. They have few traces, the trace widths are relatively large, the traces are mainly or entirely on one side of the board, and the required tolerances are not especially critical. Such designs are easily and quickly produced by a direct method which requires only a sharp knife and a soldering iron. This article describes how to make such boards and illustrates the process with a hand-cut rf board.

This process involves four basic steps: preparing the artwork used to guide the cutting, scoring the traces, peeling away undesired copper, and building the final circuit. Each of these steps will be described in detail.

Preparing the Artwork

The first step in hand-cutting a board is to decide where to cut. The best approach is to prepare a drawing of the desired circuit traces which can be used to guide the knife. This can be done a number of ways. If, for example, the circuit to be built is described in a magazine article which includes a printed-circuit-board pattern, this pattern itself, or a photocopy, can be used. Alternatively, a design can be drawn on paper and used as the guide.

If the design is to be transferred from a magazine page, it is best to make a photocopy. This not only preserves the original in case more than one board is needed, but also it gives better results because the paper used in magazines is usually too thin and slick, while a sheet of photocopier paper will be less likely to wrinkle during cutting.

If you are making your own drawing, it is best to make it larger than final size to reduce drafting tolerance errors. This, of course, is the technique used in the normal photographic production of printed circuit boards, where the artwork is typically two or four times as large as the final board. In photographic work, a large studio camera is used to make the reduction, which produces a very accurate reduced image. This accuracy is not needed for hand-cut boards, so we can use a simpler and less expensive technique.

The key to a simpler and cheaper reduction lies in the widespread availability of photocopiers which can reduce the size of an original document. This feature is designed to make it possible to print large documents on small paper and was never intended for the production of accurate artwork, but it serves well enough for our purposes.

Photocopiers with reduction capability typically reduce by at least two different factors. The two most common appear to be 77% and 64%. If original artwork is reduced by 77% and the resultant copy is itself further reduced by 64%, the final copy is smaller by a factor of $.77 \times .64 = .493$. Thus, if the original was twice the desired final size, the second copy will be the desired size with a deviation of only a few percent.

No matter which approach is used to produce the artwork, the next step is to cut it out and paste it directly onto the circuit board's copper surface. One of the better glues for this seems to be regular rubber cement. This glue quickly sticks the paper to the copper, the artwork can be smoothed to remove air bubbles, and the paper is firmly held during cutting. After cutting, the paper is easily peeled away; the rubber cement leaves no residue to interfere with soldering.

Up until now the assump-

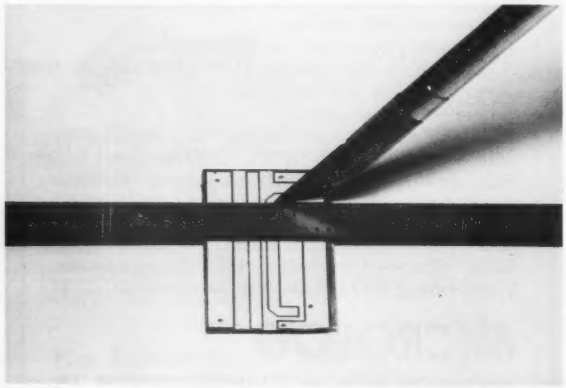

Photo A. The paper artwork has been cemented to the copper-clad circuit-board stock, and a steel ruler is used to guide the razor knife along straight lines to score the copper.

Photo B. The copper to be removed is first lifted at one end by simultaneously heating the area and sliding a knife point under the piece.

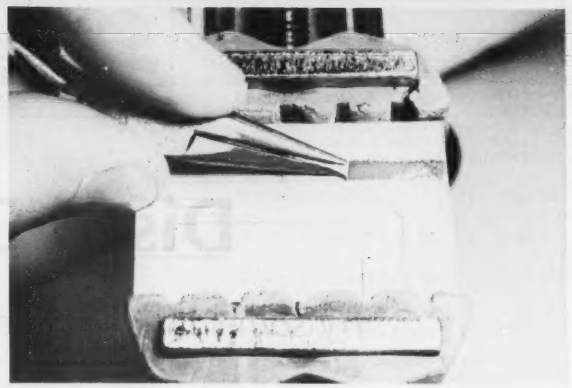

Photo C. After the edge of the copper strip is lifted a bit, grasp it with a pair of needle-nose pliers and smoothly peel away the strip.

tion has been that the circuit traces are found on only one side of the board, and that the other side is either blank (a single-sided board) or is covered with an unbroken ground plane (as is common in rf microstrip circuits). If traces must be cut on both sides, some way to align the two sides is needed. One way to do this is to drill a few alignment holes as aids in lining up the two sides. Other than this, production of a two-sided circuit is the same as a single-sided board.

Cutting the Traces

Once the paper pattern has been glued to the surface of the board, the next step is to score the edges of the traces. This step requires a sharp knife, a steel ruler, and a bit of care.

The best knife to use for cutting the traces is a hobbyist's razor-edge knife. This knife should have a razor-sharp blade stiff enough so that moderate pressure can be applied to score the copper. It should also have a handle—don't try to cut with a bare razor blade or the results could be gory.

It is at this point that you realize the advantages of circuit traces which are straight lines. The steel ruler serves as a guide for the knife blade when cutting straight lines and provides maximum accuracy. Curves can be cut, but they must be cut freehand, or else some type of cutting jig must be found. A drafting "French curve" would probably serve. No matter what type of guide is used, it seems best to apply moderate pressure and to go over the line to be cut several times. If cutting freehand, make the first cut for accuracy and then go over that scored line several times. The object is not necessarily to cut all the way through the copper, but rather to produce a heavy score line along which the undesired copper can be peeled away.

Go over all of the lines to be cut and check to see that none has been missed; once the paper has been peeled away, it is harder to add missed traces. Next, use a center punch or awl to dimple the copper at all the locations where holes are to be drilled.

Photo A shows the first steps of the cutting process. A simple rf board, in this case a microstrip directional coupler for the 1296-MHz band, has its photocopied artwork glued to the copper. The knife is guided along the lines by the ruler to accurately score the traces.

Now strip off the paper artwork and remove any of the rubber cement which remains on the board. A rubber pencil eraser works well to roll any remaining bits of glue off the copper. Inspect the board to see that none of the lines or hole guides has been forgotten.

Peeling Off Unneeded Copper

The next step involves removing the undesired areas of copper. This is easily done with the point of the razor knife and the aid of some heat from a soldering iron.

Printed-circuit-board material has a surface layer of copper glued to a fiberglass base material. If the copper is heated a bit, the glue's grip is greatly reduced, as anyone who has ever "lifted" a printed circuit pad has discovered. This tendency can be used to our advantage, though.

Apply a bit of heat to the edge of one of the copper pieces to be removed, and at the same time gently slide the point of the knife under the edge of the copper. The copper will lift easily in the heated area. Lift a large enough piece of copper so that a pair of needle-nose pliers can get a grip. Photo B shows the edge of a trace being lifted this way.

Then, without using more heat, a strip of copper can be gently pulled away from the board, as shown in Photo C. With some care, a large piece of copper can be stripped away. Usually the stripped piece will break when a scored line is reached. At this point, use the knife and soldering iron to again lift a corner and continue with the pliers.

Sometimes the most difficult part of stripping away the undesired copper is to avoid removing circuit traces. In the effort to carefully remove small areas of copper, it is easy to lose sight of the larger picture and remove desired pieces as well. To avoid this, color in the areas to be saved with a felt-tip marker before peeling.

After all of the excess copper areas have been removed, drill all of the holes in the board using the dimples as drill-centering guides. Clean the board with rosin flux remover, and it is ready for assembly.

Summary

Prototype circuit boards can be produced quickly by using these simple techniques. With practice, nearly any board can be cut by hand, not only simple rf boards, but more intricate analog and digital circuitry as well. The results, while not up to the standards of printed circuit boards, are nevertheless satisfactory for many amateur projects; the low cost and rapidity of the method are unbeatable! ■

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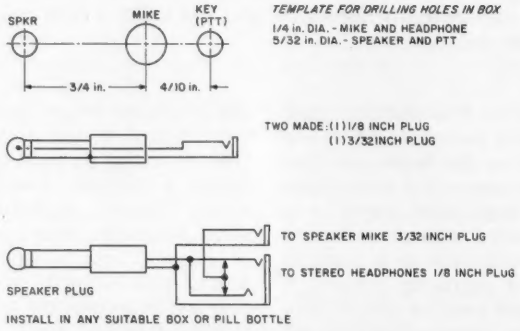
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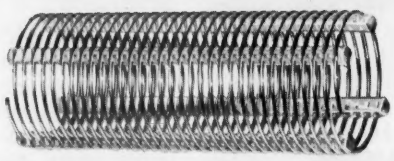

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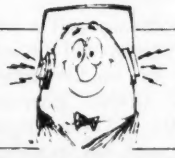

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Ntty Grtty RTTY

Tomorrow, to Morrow, is too late. Build this easy Timex/Sinclair interface today and be on the air tonight.

Many would-be RTTY enthusiasts no doubt are dismayed when they discover the potential high cost of quality RTTY gear. Although many inexpensive computers are on the market today, the cost of the interface and software usually far exceeds the price of the computer itself.

The Timex/Sinclair (T/S) computer is a very low cost, self-contained system. With an ordinary cassette recorder, a black-and-white television, and the transceiver interface system and software described in this article, you can have a complete RTTY terminal:

1) You will be able to transmit and receive Baudot code at 60, 66, 75, and 100 words per minute with a 170-Hz or 850-Hz shift, and

2) Receive 425-Hz shift commercial Baudot code broadcasts at all speeds listed above.

3) It will have a simple transmit/receive control with an optoisolated T/R switch,

4) LED indicators for high and low received tones, with carrier detect, for simple tuning,

5) 850-Hz and 170-Hz six-pole active bandpass filters to combat QRM, and

6) An audio frequency-shift keying (FSK) monitor during transmit to ensure that the typed character is sent.

7) Everything is powered by the T/S computer power supply.

At today's prices, the computer and interface circuit together will cost about $100.

The software and a full-display screen will fit into the 2K of random-access memory (RAM) provided with the Timex/Sinclair TS-1000 with no modifications required to the com-

Photo A. The Timex/Sinclair computer, along with a TV, cassette recorder, interface unit, and a transceiver, make up the complete RTTY station.

Photo B. The interface unit is versatile enough for the various amateur and commercial RTTY code-reception schemes, as well as 170-Hz and 850-Hz transmission using standard mark and space frequencies. Note the toroid rf chokes on the computer power and video cables.

puter itself. My software went into a Sinclair ZX81 which I converted to 2K of RAM through a simple chip substitution described in this article.

I have learned to touch-type on the Sinclair's membrane keyboard and seem to do about 30 wpm. For heavy use, you will probably want to attach one of the after-market full-stroke keyboards.[1]

If you are unfamiliar with the mechanics of RTTY, you might want to read the introductory article by W9IF[2] for an excellent explanation of the basics.

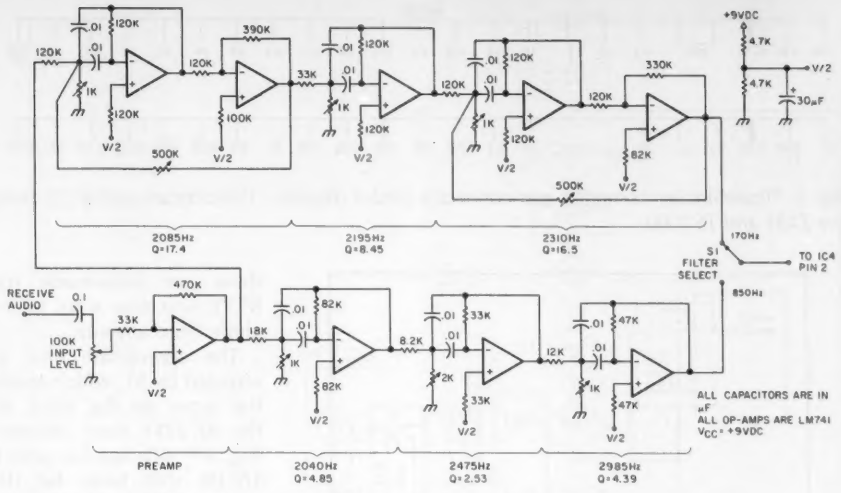

Fig. 1. Schematic of the 170-Hz and 850-Hz active bandpass filters.

FSK Receiver

The receiver section of the RTTY interface is built around a high-quality filter section followed by a phase-locked-loop (PLL) tone-decoder chip. Low-level audio tones are amplified by the 741 preamp (Fig. 1) and then processed by selectable six-pole bandpass filters for either 170-Hz or 850-Hz shifts. The filters are based upon a design by K2OAW[3] and go a long way toward eliminating nearby QRM. Be sure to use polystyrene or mylar™ capacitors on the op amps for temperature stability. K2OAW also recommends the use of single 741 op-amp packages rather than the dual or quad types. The passband of each filter stage is calculated by dividing the center frequency by

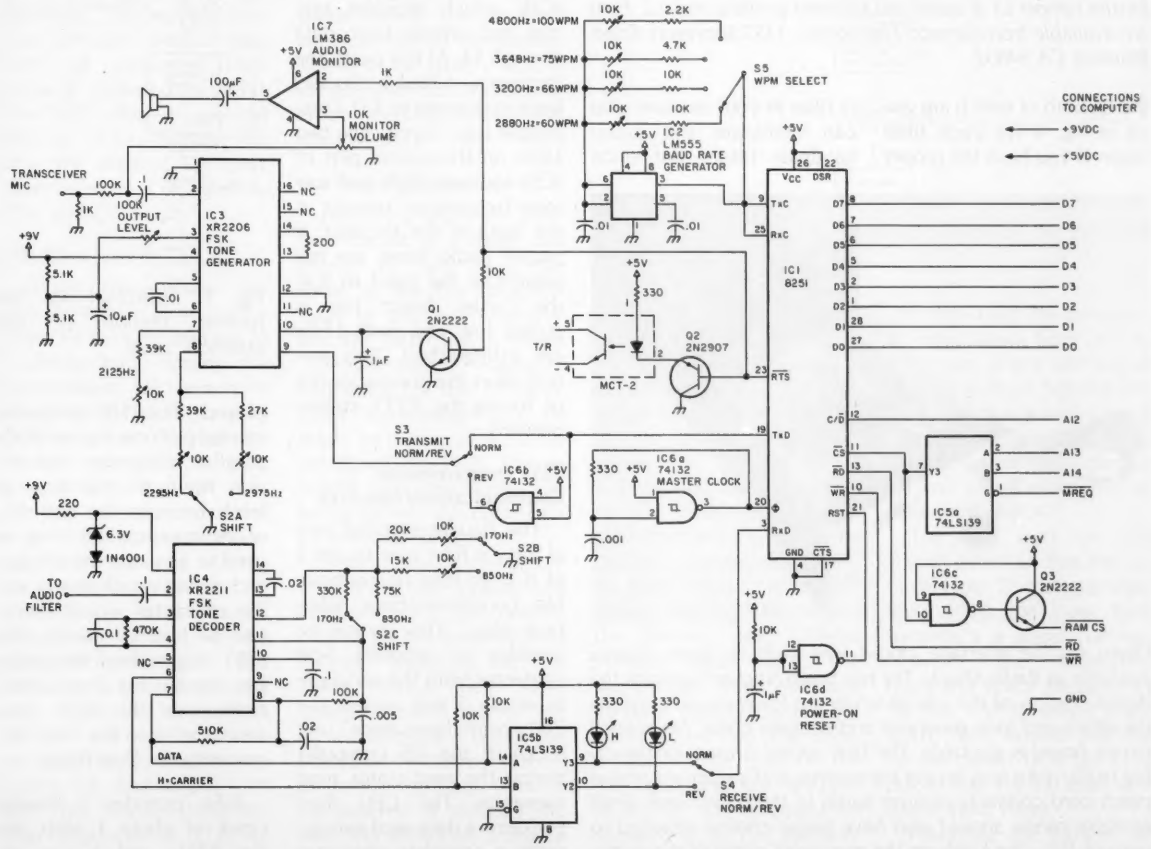

Fig. 2. Schematic of the computer interface circuit, along with the RTTY tone encoders and decoders.

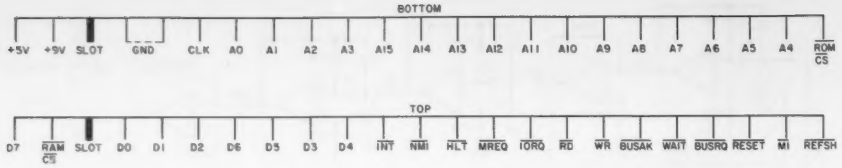

Fig. 3. Timex/Sinclair computer rear-connector pinout diagram. This diagram applies to both the ZX81 and TS-1000.

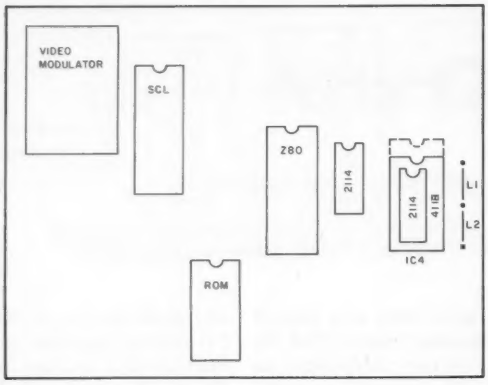

Fig. 4. ZX81 computer circuit-board integrated-circuit layout. To convert the computer RAM to 2K, remove the 2114/4118 chip(s) and replace with a 2016 or 6116 chip at location IC4. Ensure jumper L1 is open, and connect a wire across L2. Parts are available from Jameco Electronics, 1355 Shoreway Road, Belmont CA 94002.

the Q, both of which are given in Fig. 1 for each filter stage. If you have the proper i-f filter in your receiver, you can eliminate the audio bandpass filters, but since these are tailor-made for RTTY, you may want to include them anyway.

The appropriate filter is selected by S1, which sends the tones to the input of the XR-2211 tone decoder (Fig. 2).[4,6] S2b and S2c select 170-Hz shift tones for HF amateur RTTY or 850-Hz shift tones for both VHF amateur and 425-Hz shift commercial signals. The zener regulator on pin 1 of IC4 eliminates ripple from the T/S computer's 9-V supply for reliable decoding.

The carrier detect and data lines of IC4 are sent to IC5b, which provides normal and reverse logic data through S4. At this point, the frequency-shifted audio has been converted to TTL-compatible logic levels. The two LEDs on the output pins of IC5b indicate high and low tone frequencies present at the input of the decoder. If proper audio tones are not present at the input to IC4, the carrier detect line is pulled low and both LEDs are extinguished. This system takes the guesswork out of tuning the RTTY station properly.

Photo C. The interface circuit was built on proto boards available at Radio Shack. The top board (shown) contains the digital portion of the circuit while the lower board contains the filters and tone generator and decoder chips. No printed circuit board is available. The DIN socket is used for the cable to the mike jack on the transceiver, and a standard phono patch cord connects receiver audio to the phono jack. Both of these cables should also have toroid chokes attached to prevent RFI. The knob on the rear panel controls the audio-monitor volume.

8251 Programmable Communications Interface

The Baudot-encoded serial data is now sent to pin 3 of IC1, an Intel programmable communications interface chip.[7] This device assembles a complete 5-bit character from the serial data at pin 3 and signals the Z80 central-processor unit (CPU) of the T/S computer during the next status read operation. The CPU then performs a data read and accepts a complete character to be decoded and displayed. The T/S computer cannot perform the serial-to-parallel character conversion itself, in real time at least, because the majority of its computation time is used to generate the display and a portion of nearly every character would therefore be lost. Of course, the 8251 chip solves this problem neatly. For more information on the 8251, you should refer to the *Intel Microcomputer Data Book*.

IC6a provides a master clock of about 1 MHz for the 8251, and IC2 is an astable multivibrator acting

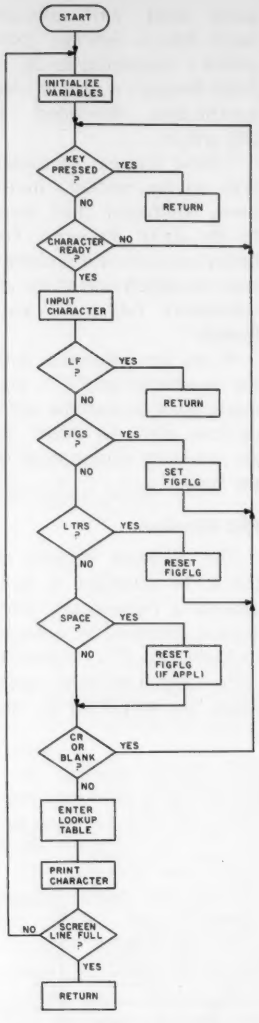

Fig. 5. Flowchart for the receive portion of the assembly code.

```
ADDR  CODE      MNEMONIC              COMMENT

4082    16 00         LD D,00H        Addr 4082H or 16514(10)
4084    06 20         LD B,20H
4086 21 49 41 RLOOP:  LD HL,FLG       Addr 4149H
4089 3A 25 40 SLOOP:  LD A,(LAST_K)   Addr 4025H
408C       3C         INC A
408D       C0         RET NZ          Return if key pressed
408E 3A 00 70         LD A,(7000H)    8251 chip status
4091    CB 4F         BIT 1,A         Data available?
4093    28 F4         JR Z,SLOOP      Jump if no
4095 3A 00 60 INCHR:  LD A,(6000H)    Input chr from 8251
4098    FE 02         CP 02H          LF?
409A       C8         RET Z           Return if yes
409B    FE 1B         CP 1BH          FIGS?
409D    20 04         JR NZ,LCK       Jump if no
409F    CB EE         SET 5,(HL)      Set FIGFLG
40A1    18 E6         JR SLOOP
40A3    FE 1F   LCK:  CP 1FH          LTRS?
40A5    20 04         JR NZ,SPCK      Jump if no
40A7    CB AE         RES 5,(HL)      Reset FIGFLG
40A9    18 DE         JR SLOOP
40AB    FE 04 SPCK:   CP 04H          SPACE?
40AD    20 02         JR NZ,DEC       Jump if no
40AF    CB AE         RES 5,(HL)      Reset FIGFLG (if appl)
40B1       86   DEC:  ADD A,(HL)      Offset 32 if FIGFLG set
40B2       5F         LD E,A
40B3    E6 17         AND 17H         CR or BLANK?
40B5    28 D2         JR Z,SLOOP      Jump if yes
40B7       19         ADD HL,DE       Enter lookup table
40B8       4E         LD C,(HL)
40B9       79         LD A,C
40BA       D7         RST 10H         Print chr (ROM routine)
40BB    10 01         DJNZ 01H        32 chrs printed?
40BD       C9         RET             Return if line complete
40BE    18 C6         JR RLOOP
```

Fig. 6. Receive assembly-code listing.

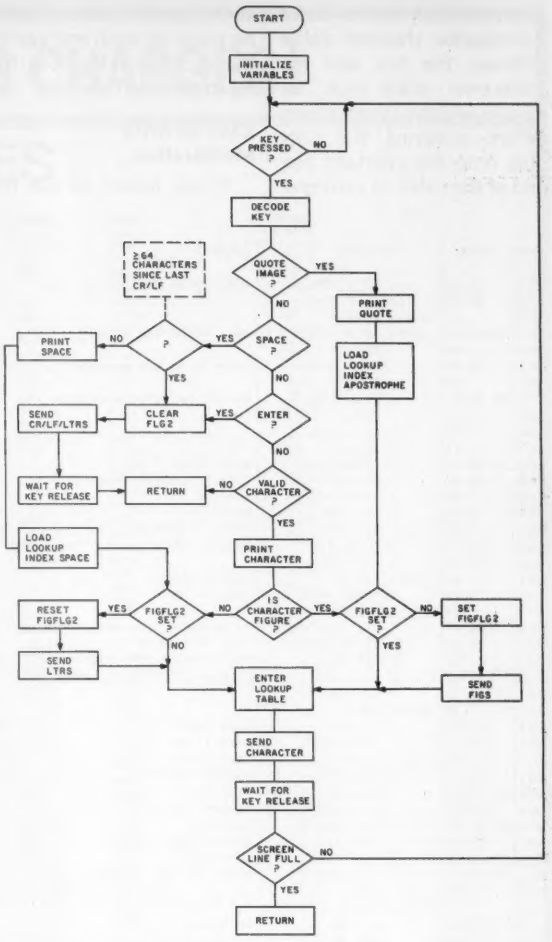

Fig. 7. Flowchart for the transmit portion of the assembly code.

as a baud-rate generator for 60-wpm (45-baud), 66-wpm (50-baud), 75-wpm (57-baud), and 100-wpm (75-baud) data rates. A power-on reset pulse is provided by IC6d. The 8251 chip is selected through IC5a; during this time the internal T/S computer memory is disabled by IC6c and Q3.

FSK Generator

When transmission begins, the 8251 is given a command by the CPU and pin 23 is driven low, causing the optoisolated T/R switch to close and the audio monitor (IC7) to come on. Also, the XR-2206 tone generator (IC3) is activated when Q1 cuts off. The tone generator and monitor do not operate during receive to avoid interference to the tone decoder.

When a valid Baudot character is entered on the computer's keyboard, this character is loaded into the 8251 which clocks the data serially out of pin 19, through the normal/reverse switch, S3, and to pin 9 of IC3. This function-generator chip produces a 2125-Hz mark tone when pin 9 is !ow and a selectable 2295- or 2975-Hz space tone when pin 9 is high.[5,6] The mark and space tones are inverted when S3 is set to reverse. The selector switch, S2a, is ganged with S2b and S2c to ensure identical receive and transmit shifts.

Hardware Construction

Be sure to build the interface circuit in a metal box (Photo B), and keep the wires to the T/S computer short or you won't believe the RFI you'll get. A 46-pin .100-inch-spaced edge-card connector for the T/S computer back-panel can be made by cutting down a Radio Shack 276-1545. The required computer signals can be tapped off this connector by referring to Fig. 3.

Note the toroid-core chokes on the power and display wires to the computer and on the transmit and receive lines to the rig. These chokes help keep computer noise out of the rig and transmit rf out of the computer. With my system as shown, computer noise in the receiver is virtually nil, and 100 Watts of continuous RTTY-transmit power will not affect computer operation. If you have RFI trouble, try changing equipment positions, ground connections, antenna location (if possible), and the number of turns of wire on the toroid chokes.

The adjustment procedure is straightforward. Set each filter pot (Fig. 1) for the desired response; the 1k and 2k pots adjust center frequency and the 500k pots on the 2085-Hz and 2310-Hz sections adjust the Q. The single-stage filter elements all have their Q fixed at the value shown on the schematic. Set the pots on the 555 (IC2) and the XR-2206 (IC3) for the frequencies shown (Fig. 2). You can activate the XR-2206 by temporarily grounding the base of Q1. Now feed the transceiver mike signal from IC3 to the input of IC4 and adjust the two pots on S2b for reliable switching while using the LEDs as indicators. As an alternative, an audio generator will allow more precise alignment of IC4.

The two pots on S2b should be set so that the data (IC4 pin 7) changes logic level when the input tone frequency is about halfway between the respective mark and space frequencies for the 170-Hz and 850-Hz shifts. Also, ensure that the carrier detect (IC4 pin 6) is pulled high for the mark and space input tones.

Assemble the jumper cables between the interface box and your rig. I used a

DIN socket on the box and a 2-conductor shielded cable between the box and my transceiver mike jack. Be sure to add the toroid choke before soldering the DIN plug onto the interface box end of the cable. A common stereo patch cord with phono plugs on each end carries the receive audio from the rig to the interface box.

ZX81 2K RAM Modification

If you intend to use the ZX81 computer in your RTTY system, you'll need to replace the 1K RAM chips with 2K of RAM to make room for the software and display requirements. (The TS-1000 already has 2K of RAM, so skip this section if you have one of these computers.)

First, peel off the four rubber feet on the bottom of the ZX81 and remove the five screws and the back panel. Remove the circuitboard screws and carefully turn the board over. Gently remove the keyboard cables from their sockets. Refer to Fig. 4 for chip placement, and remove both 2114 ICs or the single 4118 IC. Either memory configuration may be used in the ZX81. I recommend using de-soldering braid, and don't force anything; traces are easily broken. Remove the jumper wire at L1, if it exists.

Now solder a 2016 or 6116 2K × 8 RAM chip at position IC4. Notice that the circuit board has 28 holes in this position; use the *lower* 24 holes. Solder a jumper at L2 to connect address line A10 to the RAM chip, and reassemble the computer.

To check memory operation, type:

```
PRINT PEEK 16388
+ 256 * PEEK 16389
```

This should give a result of 18432 if the 2K of RAM is working properly.

The Software

Many of you probably have discovered that the T/S computer has a very slow Basic interpreter due, once again, to the large percentage of computation time required for the display. I designed the RTTY software to be somewhat of a hybrid: part Basic for convenience and part Z80 assembly code for speed.

Figs. 5–8 give listings and flowcharts for the receive and transmit portions of the software, both of which are written in assembly language. For the most part, these routines handle the Baudot-to-Sinclair code conversion and character display during receive, and the keyboard input, character display, and Sinclair-to-Baudot conversion during transmit.

Fig. 9 shows a listing of the assembly-stuffer program. Line 1 saves 199 bytes of space in RAM for the actual code and includes the Baudot-Sinclair and Sinclair-Baudot lookup tables. Line 2 contains all of the assembly code in Figs. 6 and 8 as one long string. Lines 3–7 convert this string into actual hexadecimal numbers, then stuff them into the memory reserved in line 1.

Enter this program exactly as shown in Fig. 9, then RUN it. When the run is complete, LIST the program and check that the decimal numeric sequences have been replaced with jumbled code and that the two lookup tables are still intact. The jumbled listing is the display read-only-memory (ROM) interpretation of the actual assembly code located there. Now DELETE all of the program *except* line 1, CLEAR the variables, and you are ready to enter the Basic part of the software.

The listing of Basic commands is shown in Fig. 10. Lines 10–80 will allow for an unshift-on-space routine in the assembly code for receive by POKEing appropriate commands into locations 40AFH and 40B0H (Fig. 6). If the unshift on space is not selected, NOPs are put into these two locations. Lines 90–100 software reset the 8251 chip, and lines 110–190 are the receive portion of the program. This routine sends the receive command to the 8251, scrolls the screen on each line feed (LF) or when 32 characters have been displayed, and monitors the keyboard for SHIFT T (CHR$ 221) for a jump to the transmit routine located at line 200 and beyond. This por-

```
ADDR   CODE          MNEMONIC              COMMENT

40C0     16 00         LD D,00H            Addr 40C0H or 16576(10)
40C2     06 20         LD B,20H
40C4        C5  WKEY: PUSH BC
40C5  ED4B2540 LOOP:  LD BC,(LAST_K)      Addr 4025H and 4026H
40C9        0C        INC C
40CA     28 F9        JR Z, LOOP          Loop if no key pressed
40CC        0D        DEC C
40CD  CD BD 07        CALL 07BDH          Decode key (ROM routine)
40D0        C1        POP BC
40D1        4E        LD C,(HL)
40D2        79        LD A,C
40D3  21 89 41        LD HL,FLG2          Addr 4189H
40D6     FE C0        CP C0H              Code "" (quote image)?
40D8     20 07        JR NZ,NOAP          Jump if no
40DA     3E 0B        LD A,0B             Code "
40DC        D7        RST 10H             Print " (ROM routine)
40DD     1E 36        LD E,36H            Lookup table index, apostrophe
40DF     18 32        JR FIGS
40E1        A7  NOAP: AND A               Code SPACE?
40E2     20 0A        JR NZ,NOSP          Jump if no
40E4        4E        LD C,(HL)
40E5     CB 71        BIT 6,C             64 or more chrs sent since CR/LF?
40E7     20 0A        JR NZ,CR/LF         Jump if yes
40E9        D7        RST 10H             Print space (ROM routine)
40EA     1E 37        LD E,37H            Lookup table index, space
40EC     18 31        JR LTRS
40EE        3D  NOSP: DEC A
40EF     FE 75        CP 75H              Code ENTER?
40F1     20 14        JR NZ,FCHR          Jump if no
40F3        72 CR/LF: LD (HL),D          Clear FLG2
40F4     0E 08        LD C,08H            Baudot code CR
40F6  CD 3E 41        CALL XMTCH          Send CR
40F9     0E 02        LD C,02H            Baudot code LF
40FB  CD 3E 41        CALL XMTCH          Send LF
40FE     0E 1F        LD C,1FH            Baudot code LTRS
4100  CD 3E 41        CALL XMTCH          Send LTRS
4103  CD 37 41        CALL NOKEY          Wait for key release
4106        C9        RET
4107        3C  FCHR: INC A
4108     FE 40        CP 40H              Valid key press?
410A        D0        RET NC              Return if no
410B        D7        RST 10H             Print chr (ROM routine)
410C     D6 0A        SUB 0AH             Align code with lookup table
410E        5F        LD E,A
410F     FE 1C        CP 1CH              Is chr a figure?
4111     30 0C        JR NC,LTRS          Jump if no
4113        4E  FIGS: LD C,(HL)
4114     CB 79        BIT 7,C             FIGFLG2 set?
4116     0E 1B        LD C,1BH
4118  CC 3E 41        CALL Z,XMTCH        Send FIGS if no
411B     CB FE        SET 7,(HL)          Set FIGFLG2
411D     18 0A        JR LOCCH
411F        4E  LTRS: LD C,(HL)
4120     CB 79        BIT 7,C             FIGFLG2 set?
4122     0E 1F        LD C,1FH
4124  C4 3E 41        CALL NZ,XMTCH       Send LTRS if yes
4127     CB BE        RES 7,(HL)          Reset FIGFLG2
4129        34 LOCCH: INC (HL)            Update chr count
412A        19        ADD HL,DE           Lookup table index
412B        4E        LD C,(HL)           Enter lookup table
412C  CD 3E 41        CALL XMTCH          Send chr
412F  CD 37 41        CALL NOKEY          Wait for key release
4132     10 01        DJNZ 01H            32 chrs printed?
4134        C9        RET                 Return if yes
4135     18 8D        JR WKEY
4137  3A 25 40 NOKEY: LD A,(LAST_K)       Addr 4025H
413A        3C        INC A
413B     20 FA        JR NZ,NOKEY         Loop if key pressed
413D        C9        RET
413E  3A 00 70 XMTCH: LD A,(7000H)        8251 chip status
4141        1F        RRA
4142     30 FA        JR NC,XMTCH         Loop if 8251 busy
4144        79        LD A,C
4145  32 00 60        LD (6000H),A        Send chr to 8251
4148        C9        RET

4149          Addr of FLG
414A-4188     Addr of Baudot to Sinclair lookup table
4189          Addr of FLG2
418A-41C1     Addr of Sinclair to Baudot lookup table
```

Fig. 8. Transmit assembly-code listing.

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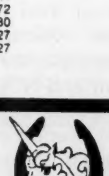
TUBES

TYPE	PRICE	TYPE	PRICE	TYPE	PRICE
2C39/7289	$ 28.90	813	$ 42.50	7843	$ 90.95
2E26	6.75	1182/4600A	425.00	7854	110.50
2K28	170.00	4600A	425.00	ML7855KAL	106.25
3-500Z	86.70	4624	263.50	7984	12.70
3-1000Z/8164	340.00	4657	71.50	8072	71.50
3B28/866A	8.10	4662	85.00	8106	4.25
3CX400U7/8961	215.00	4665	425.00	8117A	191.25
3CX1000A7/8283	447.00	5675	36.00	8121	93.50
3CX3000F1/8239	482.00	5721	212.50	8122	93.50
3CW30000H7	1445.00	5768	106.25	8134	399.50
3X2500A3	402.00	5819	101.00	8156	10.20
3X3000F1	482.00	5836	198.00	8233	51.00
4-65A/8165	58.65	5837	198.00	8236	29.75
4-125A/4D21	67.15	5861	119.00	8295/PL172	425.00
4-250A/5D22	83.50	5867A	157.25	8458	29.75
4-400A/8438	83.50	5868/AX9902	229.50	8462	110.50
4-400B/7527	93.50	5876/A	35.70	8505A	80.75
4-400C/6775	93.50	5881/6L6	6.80	8533W	115.60
4-1000A/8166	377.50	5893	51.00	8560/A	63.75
4CX250B/7203	46.00	5894/A	46.00	8560AS	85.00
4CX250FG/8621	63.75	5894B/8737	46.00	8608	32.30
4CX250K/8245	102.25	5946	335.75	8624	85.00
4CX250R/7580W	76.50	6083/AZ9909	80.75	8637	59.50
4CX300A/8167	144.50	6146/6146A	7.25	8643	70.55
4CX350A/8321	93.50	6146B/8298	9.00	8647	142.80
4CX350F/8322	97.75	6146W/7212	14.75	8683	80.75
4CX350FJ/8904	119.00	6156	93.50	8877	395.25
4CX600J/8809	710.00	6159	11.75	8908	11.05
4CX1000A/8168	206.00	6159B	20.00	8950	11.05
4CX1000A/8168	412.25	6161	276.25	8930	116.50
4CX1500B/8660	471.00	6280	36.25	6L6 Metal	21.25
4CX5000A/8170	935.00	6291	153.00	6L6GC	4.25
4CX10000D/8171	1067.00	6293	20.50	6CA7/EL34	4.60
4CX15000A/8281	1275.00	6360/A	4.85	6CL6	3.00
4CW800F	603.50	6399	459.00	6DJ8	2.15
4D32	204.00	6550A	8.50	6D05	5.60
4E27A/5-125B	204.00	6883B/8032A/8552	8.50	6GF5	5.00
4PR60A	170.50	6897	136.00	6GJ5A	5.30
4PR60B	283.25	6907	67.15	6GK6	5.10
4PR65A/8187	148.75	6922/6DJ8	4.25	6HB5	5.10
4PR1000A/8189	501.50	6939	18.75	6HF5	7.45
4X150A/7034	51.00	7094	212.50	6JG6A	5.35
4X150D/7609	81.00	7117	32.75	6JM6	5.10
4X250B	38.25	7211	85.00	6JN6	5.10
4X250F	38.25	7213	255.00	6JS6C	6.15
4X500A	350.00	7214	255.00	6KN6	4.30
5CX1500A	561.00	7271	114.75	6KD6	7.00
KT88	23.50	7289/2C39	28.90	6LF6	5.95
416B	38.25	7360	11.50	6LQ6 G E	5.95
416C	53.00	7377	72.25	6LQ6/6MJ6 Sylvania	7.65
572B/T160L	42.50	7408	2.10	6ME6	7.55
592/3-200A3	179.50	7609	80.75	12AT7	3.00
807	7.25	7735	30.60	12AX7	2.55
811A	12.75	ML7815AL	51.00	12BY7	4.25
812A	24.75			12JB6A	5.50

RF TRANSISTORS

2N1561	21.25	2N4428	1.57	2N5913	2.75	MRF223	11.25	MRF463	21.25
2N1562	21.25	2N4430	10.03	2N5916	30.60	MRF224	13.15	MRF472	0.85
2N1562	19.99	2N4957	2.93	2N5922	8.50	MRF231	9.28	MRF475	2.65
2N1692	21.25	2N4959	1.95	2N5923	21.25	MRF232	10.25	MRF476	1.70
2N2857JAN	3.49	2N5090	11.73	2N5941	19.55	MRF233	10.75	MRF477	12.70
2N2857JANTX	3.49	2N5108	2.93	2N5944	8.80	MRF237	2.70	MRF492	19.55
2N2876	11.49	2N5109	1.45	2N5945	9.80	MRF238	11.75	MRF502	0.90
2N2947	15.60	2N5160	2.95	2N5946	12.25	MRF239	14.65	MRF503	5.10
2N2948	11.05	2N5177	18.40	2N6080	8.80	MRF245	30.30	MRF504	5.95
2N2949	13.19	2N5179	0.88	2N6081	10.25	MRF247	30.30	MRF509	4.25
2N2957	1.32	2N5126	47.60	2N6082	10.75	MRF304	36.95	MRF511	9.10
2N3375	14.55	2N5583	2.95	2N6083	11.25	MRF309	28.75	MRF515	1.70
2N3553	1.32	2N5589	8.30	2N6084	12.75	MRF314	24.25	MRF517	1.70
2N3632	13.19	2N5590	9.30	2N6094	9.35	MRF315	24.55	MRF559	1.75
2N3733	9.35	2N5591	11.75	2N6095	10.20	MRF317	54.35	MRF605	17.00
2N3818	4.25	2N5637	13.20	2N6096	13.70	MRF420	17.00	MRF618	21.25
2N3866	1.10	2N5641	10.55	2N6097	17.60	MRF421	31.28	MRF628	7.35
2N3866JAN	1.87	2N5642	11.95	2N6105	17.85	MRF422A	35.19	MRF629	2.95
2N3924	2.85	2N5643	13.20	2N6136	18.55	MRF427	14.65	MRF644	23.45
2N3927	14.65	2N5645	11.75	2N6166	34.20	MRF428	39.10	MRF646	25.45
2N3950	21.25	2N5646	17.59	2N6201	42.50	MRF433	10.25	MRF816	12.75
2N4012	9.35	2N5651	9.39	2N6304	1.35	MRF449A	10.75	MRF823	17.00
2N4041	11.90	2N5691	15.30	2N6459	15.30	MRF450A	12.20	MRF901 (3 LEADS)	0.85
2N4072	1.53	2N5764	22.95	2N6567	8.55	MRF453A	15.65	MRF901 (4 LEADS)	1.70
2N4080	3.85	2N5836	2.95	2N6680	68.00	MRF454A	17.10	MRF904	1.95
2N4127	17.85	2N5842	7.20	2N5942	34.00	MRF455A	13.60	MRF911	2.55
2N4427	1.10	2N5849	17.00	MRF208	13.70	MRF458	17.60	MRF961	1.95
				MRF212	13.70				



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```
1 REM 12345678901234567890123456
7890123456789012345678901234567 8
9012345678901234567890123456789 0
1234567890123456789012345678901 2
3456789012345678901234567890123 4
5678901234567890123456789012345 6
7890123456789 E A SIU DRJNFCKTZL
WHYPQOBG MXV  3 - B87 $4",*:(5")
2 6019?+ ./;  LODITJM997U7HXGWQR
N5EKPBAS7T1D5HUOAFJMWGSQRE9KBYNX
PLF8
2 LET A$="160006202149413A25403C
C03A0070CB4F28F43A0060FE02C8FE1B
2004CBEE18E6FE1F2004CBAE18DEFE04
2002CBAE865FE61728D2194E79D71001
C918C616000620C5ED4B25400C28F90D
CDBD07C14L79218941FEC020073E0BD7
1E361832A7200A4ECB71200AD71E3718
313DFE752014720E08CD3E410E02CD3E
410E1FCD3E41CD3741C93CFE40D0D7D6
0A5FFE1C300C4ECB790E1BCC3E41CBFE
180A4ECB790E1FC43E41CBBE34194ECD
3E41CD37411001C9188D3A25403C20FA
C93A00701F30FA79320060C9"
3 LET A=16514
4 FOR B=1 TO LEN A$-1 STEP 2
5 POKE A,16*CODE A$(B)+CODE A$(B
+1)-476
6 LET A=A+1
7 NEXT B
8 PRINT "RUN COMPLETE"
```

Fig. 9. Listing of the assembly-stuffer program. When you key in and RUN this program, the transmit and receive assembly code shown in Figs. 6 and 8 will be entered into the computer's memory automatically.

```
 1 REM [RTTY Assembly Code & Lookup Tables]
10 PRINT AT 20,0; "UNSHIFT ON SPACE (Y/N)?"
20 INPUT A$
30 IF A$<>"Y" THEN GOTO 70
40 POKE 16559,203
50 POKE 16560,174
60 GOTO 90
70 POKE 16559,0
80 POKE 16560,0
90 POKE 28672,128
100 POKE 28672,64
110 POKE 28672,67
120 IF INKEY$<>"" THEN GOTO 120
130 POKE 28672,4
140 SCROLL
150 PRINT "<<RECEIVE TEXT>>"
160 SCROLL
170 LET A=USR 16514
180 IF INKEY$=CHR$ 221 THEN GOTO 200
190 GOTO 160
200 IF INKEY$<>"" THEN GOTO 200
210 POKE 28672,33
220 SCROLL
230 PRINT "<<TRANSMIT TEXT>>"
240 SCROLL
250 LET A=USR 16576
260 IF INKEY$=CHR$ 219 THEN GOTO 120
270 GOTO 240
```

Fig. 10. Listing of the Basic portion of the program. Line 1 is all that remains of the assembly stuffer, and lines 10–270 control the transmit and receive assembly program code.

tion of the program sends a transmit command to the 8251, scrolls the display, and monitors the keyboard for a SHIFT R (CHR$ 219) for a jump back to receive.

Now key in lines 10–270 and SAVE "RTTY" twice on cassette to ensure at least one good copy.

Assembling and Operating the RTTY Station

Be sure the power is off to the T/S computer before connecting (or disconnecting) the interface box. If you didn't key the connector to the slot in the T/S circuit board, be certain the connector is installed right side up. Connect the cassette recorder and TV monitor to the computer and attach the jumper cables between the interface box and your rig. Turn on the computer and receiver and follow the guidance in the Hardware Construction section (above) if you have RFI trouble.

Now LOAD and RUN the RTTY program. The unshift-on-space routine is a convenience during receive to prevent lockup in the FIGS mode if a LTRS command is missed; the system also will return to LTRS mode upon receiving a space. However, weather broadcasts consist of many strings of numbers separated by spaces, and transmission would be slowed considerably if a new FIGS command had to be sent after each space. Therefore, it would be a good idea to select unshift on space for everything except weather broadcasts.

Set your receiver to the RTTY mode, or adjust the i-f passband, to allow reception of the mark and space tones with minimum attenuation. For amateur reception on the HF bands, select the 170-Hz filter and shift, set 60 wpm, and find a RTTY signal. Your best bet will usually be just below 14100 kHz. Select normal on the NORMAL/REVERSE switches and advance the input-level pot while tuning around the RTTY station until the LEDs illuminate.

Now tune the receiver until the LEDs follow the high and low tones and, if all is well, text should appear on the screen. The system will scroll when a displayed line is full or when a line feed is received. In order to familiarize yourself with operation of the LEDs you may want to tune around an unmodulated carrier or CW signal. As the tone increases in frequency, you'll notice the L LED come on, shift to the H LED, and then both LEDs will extinguish as the tone frequency exceeds the filter/decoder passband.

To receive commercial or VHF amateur RTTY, select the 850-Hz filter and shift and tune in the same manner as above. Since the audio shift is wider here, the tuning will be slightly less critical than in the 170-Hz case. Commercial news broadcasts are usually at 67 wpm and NORMAL, weather is 100 wpm and NORMAL, and some ship-to-shore is 100 wpm, 170 Hz, and REVERSE. Many of the commercial broadcasts seem to be between 16.0 and 16.5 MHz. If you happen to run

HEX	DEC	LTRS	FIGS	T/S FIGS Print	T/S FIGS Keyboard
00	00	BLANK	BLANK	none	none
01	01	E	3	3	3
02	02	L/F	L/F	SCROLL	ENTER
03	03	A	-	-	-
04	04	SPACE	SPACE	SPACE	SPACE
05	05	S	BELL	B	< or >
06	06	I	8	8	8
07	07	U	7	7	7
08	08	C/R	C/R	none	ENTER
09	09	D	$	$	$
0A	10	R	4	4	4
0B	11	J	'	"	""
0C	12	N	,	,	,
0D	13	F	!	*	*
0E	14	C	:	:	:
0F	15	K	(	(	(
10	16	T	5	5	5
11	17	Z	"	"	"
12	18	L	)	)	)
13	19	W	2	2	2
14	20	H	#	£	£
15	21	Y	6	6	6
16	22	P	0	0	0
17	23	Q	1	1	1
18	24	O	9	9	9
19	25	B	?	?	?
1A	26	G	&	+	+
1B	27	FIGS	FIGS	none	none
1C	28	M	.	.	.
1D	29	X	/	/	/
1E	30	V	;	;	;
1F	31	LTRS	LTRS	none	none

Fig. 11. Listing of the Baudot code with appropriate decimal and hexadecimal equivalents. The special Timex/Sinclair FIGS codes for the display and keyboard are shown in the last two columns.

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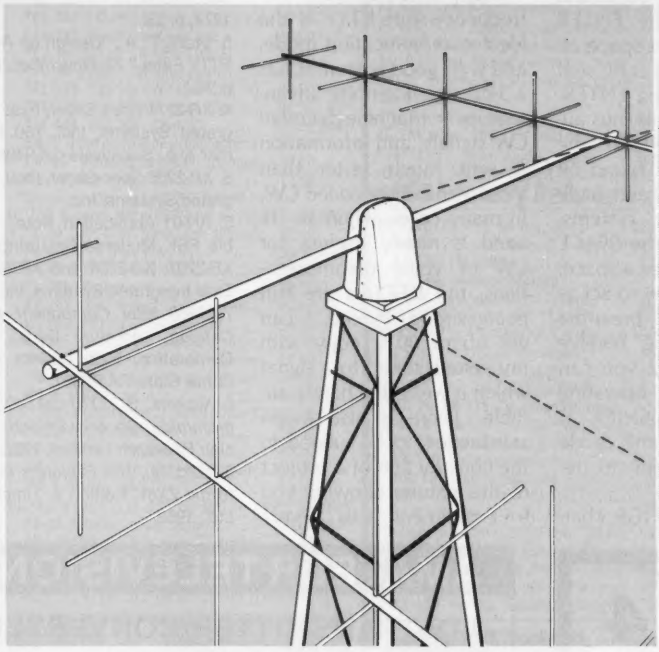

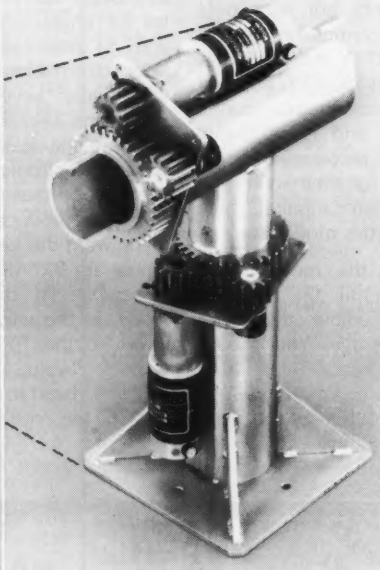

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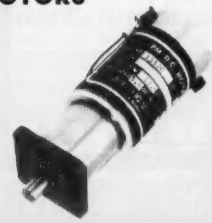

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across a non-Baudot station or if you select the wrong system parameters, garbage will print on the screen.

To transmit, simply hit SHIFT T, and if you wired the jumper correctly, your rig should switch to transmit. Adjust the output level and mike-gain controls for a reasonable rf output power. Don't overdo it—my TR7 gets plenty hot with only 60 W continuous output power. RTTY isn't like CW; the rig is putting out full power continuously during transmit, and most manufacturers recommend cooling fans for their solid-state gear when running high power in this mode.

Adjust the monitor-level control until the 2125-Hz tone is audible, then type your message. You should hear the space tones intermittently as you type. You can keep your eyes on the keyboard and simply listen for confirmation of character transmission. The 8251 chip gives you a single character buffer (big deal) so you can type a new character while the previous one is being sent.

Note that the computer automatically will send LTRS and FIGS codes where necessary and also will send a CR/LF/LTRS command when you hit the ENTER key, or on the first space after 64 characters are sent with no intervening ENTER. Your transmission is thus automatically keyed to the 80-column printer found on most mechanical and high-priced electronic systems. Also notice that the SPACE key really produces a space; if you want this key to act as a program BREAK, press the key while in the receive mode. In this way, you can return to the T/S operating system. Typing SHIFT R while in the transmit mode returns the system to receive.

Some Baudot FIGS characters are not present on the T/S keyboard for transmission or in the character set for display. The most logical substitute characters I could think of are listed, along with the Baudot character code, in Fig. 11.

Conclusion

Many amateurs feel that frequency-shift RTTY is the ideal communication mode, and with good reason. It has a 3-dB signal-to-noise advantage over machine-decoded CW signals, and information is sent much faster than most manually-decoded CW. In many cases, when an HF band is nearly useless for CW or voice communications, the RTTYers are still going strong. Indeed, I can get about 90% copy with my system tuned to a signal which is weak and barely audible. There is also much satisfaction to be gained in the construction of a project of this nature, allowing you to experiment with a very useful specialized communication mode at minimal cost. ■

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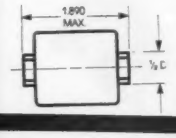

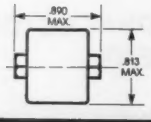

FILTERS: ENI / RFI, Bandpass, Low Pass, Crystal, Ceramic, Mechanical, COLLINS

CAPACITORS: Vacuum, Tantalum, DIP, Monolythic, Dipped Silver Mica, Electrolytic, Polycarbonate, Trimmers, all types, UHF Chips, Monolythic Ceramic

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***EX-242** FM unit	39.00	
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***FL-45** 500 Hz CW filter (1st IF)	59.50	
***FL-54** 270 Hz CW filter (1st IF)	47.50	
***FL-52A** 500 Hz CW filter (2nd IF)	96.50	**89.95**
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***FL-44A** SSB filter (2nd IF)	159.00	**144.95**
SM-5 8-pin electret desk microphone	39.00	
HM-10 Scanning mobile microphone	39.50	
MB-12 Mobile mount	19.50	
**Options also for IC-745 listed below*		
IC-730 8-band 200w PEP xcvr w/mic	$829.00	**599.95**
FL-30 SSB filter (passband tuning)	59.50	
FL-44A SSB filter (2nd IF)	159.00	**144.95**
FL-45 500 Hz CW filter	59.50	
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EX-203 150 Hz CW audio filter	39.00	
EX-205 Transverter switching unit	29.00	
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HM-10 Scanning mobile microphone	39.50	
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IC-720A 9-band xcvr/.1-30 MHz rcvr	$1349.00	**899.95**
FL-32 500 Hz CW filter	59.50	
FL-34 5.2 kHz AM filter	49.50	
SM-5 8-pin electret desk microphone	39.00	
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PS-35 Internal power supply	160.00	**144.95**
CFJ-455K5 2.8 kHz wide SSB filter	4.00	
HM-12 Hand microphone	39.50	
SM-6 Desk microphone	39.00	
**See IC-740 list above for other options (*)*		

IC-751 9-band xcvr/.1-30 MHz rcvr	$1399.00	**1199**
PS-35 Internal power supply	160.00	**144.95**
FL-32 500 Hz CW filter (1st IF)	59.50	
FL-63 250 Hz CW filter (1st IF)	48.50	
FL-52A 500 Hz CW filter (2nd IF)	96.50	**89.95**
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FL-33 AM filter	31.50	
FL-70 2.8 Khz wide SSB filter	46.50	
HM-12 Hand microphone	39.50	
SM-6 Desk microphone	39.00	
CR-64 High stability reference xtal	56.00	
RC-10 External frequency controller	35.00	
MB-18 Mobile mount	19.50	
Options: 720/730/740/745/751	Regular	SALE
PS-15 20A external power supply	$149.00	**134.95**
EX-144 Adaptor for CF-1/PS-15	6.50	

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Options - continued	Regular	SALE
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PS-20 20A switching ps w/speaker	229.00	**199.95**
CC-1 Adapt. cable; HF radio/PS-20	10.00	
CF-1 Cooling fan for PS-20	45.00	
EX-310 Voice synth for 751, R-71A	39.95	
SP-3 External base station speaker	49.50	
Speaker/Phone patch - specify radio	139.00	**129.95**
BC-10A Memory back-up	8.50	
EX-2 Relay box with marker	34.00	
AT-100 100w 8-band automatic ant tuner	349.00	**314.95**
AT-500 500w 9-band automatic ant tuner	449.00	**399.95**
MT-100 Manual antenna tuner	249.00	**224.95**
AH-1 5-band mobile antenna w/tuner	289.00	**259.95**
PS-30 Systems p/s w/cord, 6-pin plug	259.95	**233.95**
GC-4 World clock	99.95	**94.95**
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IC-2KL w/ps 160-15m solid state amp	1795.00	**1299**
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EX-106 FM option	125.00	**112.95**
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SM-2 Electret desk microphone	39.00	
IC-271H 100w 2m FM/SSB/CW xcvr	899.00	**799.95**
IC-471H 75w 430-450 SSB/CW/FM xcvr	1099.00	**Call**
PS-35 Internal power supply	160.00	**144.95**
PS-15 20A power supply	149.00	**134.95**
IC-271A 25w 2m FM/SSB/CW xcvr	699.00	**619.95**
AG-20/EX-338 2m preamplifier	56.95	
IC-471A 25w 430-450 SSB/CW/FM xcvr	799.00	**699.95**
PS-25 Internal power supply	99.00	**89.95**
EX-310 Voice synthesizer	39.95	
HM-12 Hand microphone	39.50	
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IC-22U 10w 2m FM non-digital xcvr	299.00	**249.95**
EX-199 Remote frequency selector	35.00	

Closeout Item	Regular	NOW
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BU-1H Memory back-up	38.50	†**10.00**

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IC-27A Compact 25w 2m FM w/TTP mic	369.00	**329.95**
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IC-4A for 440 MHz	269.95	**234.95**
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Accessories for Deluxe models	Regular
BP-7 800mah/13.2V Nicad Pak - use BC-35	67.50
BP-8 800mah/8.4V Nicad Pak - use BC-35	62.50
BC-35 Drop in desk charger - all batteries	69.00
BC-16A Wall charger - BP7/BP8	10.00
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BP-2 425mah/7.2V Nicad Pak - use BC35	39.50
BP-3 Extra Std. 250 mah/8.4V Nicad Pak	29.50
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EX-257 FM unit	38.00	
IC-7072 Transceive interface, 720A	112.50	
FL-44A SSB filter (2nd IF)	159.00	**144.95**
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CK-70 (EX-299) 12v DC option	9.95	
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The IC-730.

Top view: The wires for my modification are identified with white tape, here shown going to the pad 1 and pad 2 locations under the calibrate pot on the main board.

Having recently acquired Icom's IC-730, I noticed that it didn't have a RTTY mode. As I wanted to get into RTTY, I had two choices: to build up an AFSK unit or to modify. Being naturally curious, I decided to modify, if possible, and pulled out the schematic.

The PLL has a 13.66-MHz crystal and is calibrated with a 10k pot (R-162) that controls the bias on a varicap diode. By switching a resistance in parallel with the calibrate pot, you can change the frequency of the 13.66-MHz crystal oscillator and the frequency of the rig. See Fig. 1.

First remove the top and bottom covers. In order to gain access to the foil side of the main unit board, you have to remove the 17 plugs that are plugged into the main unit board. Unscrew the four mounting screws. (*Note*: The mounting screws are permanently locked to the main board.)

The coax cable from J14 has to be slid in the wiring harness toward the detector unit in order to have enough slack to turn the main unit board over.

Cut two 15-inch pieces of wire (about 22 gauge) and, referring to Fig. 2, solder one wire to pad 1 and the other wire to pad 2. Be sure to re-

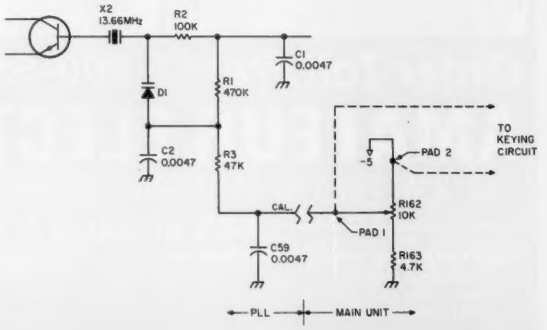

Fig. 1. Schematic.

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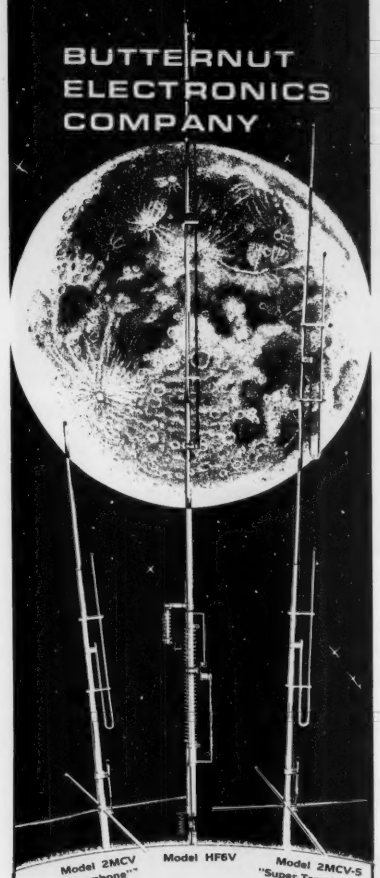

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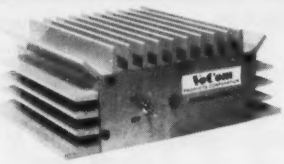

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MB30-2 A 2 meter base station amplifier that can double as a mobile amplifier as well! Nominal 2 watt input for 30 watt output. Usable 0.2 watt input (5 watt output) to 5 watt input. (40 watt output). Input voltage: 108-125 Vac to power supply; 13.8 Vdc to amplifier (provided by power supply during operation). Guaranteed bandwidth: 138-154 MHz. Dimensions: 4.5x7.75x6 (HxWxD) inches. Weight: 8 lbs. I/O connectors: SO-239 (50 ohm UHF). Power supply can deliver 6A regulated. Current limited. Thermally protected. Regulation 0.2% no load to full load. 35 mA constant current charger output (rear terminal strip output). 9.6 Vdc regulated (1A) battery eliminator output (rear terminal strip output). Automatic carrier operated antenna switch. VSWR protected. Reg. $139.95

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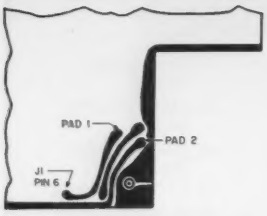


Fig. 2. Foil side of main unit board.

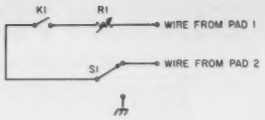


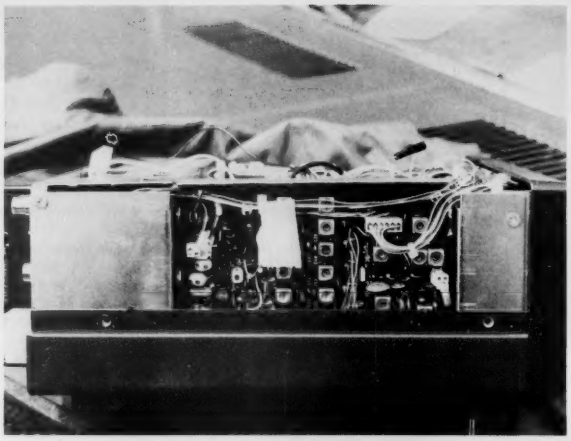
Fig. 3. Keying circuit with shift switch.

member which wire is which, as this is very important. Carefully replace the main unit board and plug the wiring harness back in.

If you don't have the optional marker unit, J15 will be empty, so don't search for the missing plug, as I did.

Remove the 8 screws at each end of the rear panel and unplug the coax cables from J1 and J3 on the low-pass filter board. Run the two wires you soldered back to the accessory socket where you have 13 unused positions just begging to be used. Make up a couple of molex® pins or, if you don't foresee any use for existing accessory connections, cut wire from two of the positions and attach your wires to them. Pin 8 of the existing socket is ground. This done, plug coax cables back in, reassemble the rig, and put the covers back on.

Referring to Fig. 3, K1 is a reed relay and R1 is a 50k pot. S1 is an optional SPDT switch used to select Mark low or Space low. Keying between pad 1 and ground makes Mark low, and keying between pad 1 and pad 2 makes Space low. Adjust R1 for desired shift. Going from Mark low to Space low or vice-versa will require readjustment of R1.



Right-side view showing routing of modification wires to the rear and then straight to molex connector.

When transmitting, use the AM mode instead of the CW mode, as the 40 Watts in AM are easier on the finals and they can operate for extended periods this way.

I will gladly answer or correspond about any questions you may have if you enclose an SASE. K1 and R1 are stock items at Radio Shack. Molex connectors with their pins also are available at Radio Shack.

So get into RTTY with your IC-730 and this very low-cost modification. It should not cost over $4.00 with all brand-new parts. See you on the bands. ■

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Easy, positive tuning with twin LED indicators.

Copy any shift (170,425,850 Hz and all other shifts) and any speed (5-100 WPM RTTY/CW and up to 300 baud ASCII).

Copies on both mark and space, not mark only or space only, to improve copy under adverse conditions.

Sharp 8 pole 170 Hz shift/CW active filter gives good copy under crowded, fading and weak signal conditions. Automatic noise limiter suppress static crashes for better copy.

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73 INTERNATIONAL

Each month, 73 brings you ham-radio news from around the world. In this collection of reports from our foreign correspondents, we present the latest news in DX, contests, and events, as well as keep you abreast of the technical achievements of hams in other countries.

If you would like to contribute to your country's column, write to your country's correspondent or to 73 Amateur Radio's Technical Journal, *Pine Street, Peterborough NH 03458, USA, Attn: Perry Donham KK2Y.*

AUSTRALIA

J. E. Joyce VK3YJ
44 Wren Street
Altona 3018
Victoria
Australia

NEW VK CALLSIGNS

The Department of Communications (DOC) has just released a new block of callsigns for the amateurs in Australia. It is getting as bad as the States, trying to keep up with the suffixes when each means something different. The new suffixes, and what they mean, are as listed below (the space is where the Australian state indicator goes):

Full amateur—VK-FAA to FZZ
Limited amateur—VK-TAA to TSZ
—VK-TUA to TZZ
Novice operator—VK-MAA to MZZ
Combined Limited
and Novice—VK-JAA to JZZ

RECIPROCAL LICENSES

I recently had reason, due to a feedback letter from the States, to check with the DOC on what is required by overseas amateurs when applying for a reciprocal license in Australia.

The main complaint in the letter received was about a clerical error—the wrong form being sent to this gentleman—but some of the points raised by him are worth explaining here, to keep this problem from happening again.

The first thing you must do is to explain fully that you require a reciprocal amateur license to operate in Australia, making sure you state the period you wish to operate. The form to ask for is "RB57 Application Radiocommunication Licence," and you need only to fill in questions No. 4—Name of Applicant, No. 5—Postal Address, and the declaration on the bottom. That's all; forget the rest as this is a multipurpose form. Make sure you apply at least four months prior to leaving for Australia.

After filling in this form, return it with a certified copy of your license, together with Australian $20.00 [about US$21.30—check with your bank] plus a large self-addressed envelope. We know that amateur licenses in the States are free, but we have to pay, at present, A$19.00 per year, and as a reciprocal license is good for a period of one year (whether you stay a year or less), it also costs that. There were questions asked of our DOC by the WIA regarding short-term licenses for overseas amateurs, but it was found that a 3-month license could be even dearer due to administrative costs. At the present time it costs A$1.00 to airmail a large 4½" × 8½" envelope to the States.

The preferred method of payment is by bank check, remembering the difference in currency value plus bank clearance charges. As you are dealing with a government department and not an individual, ten cents over is a lot better than ten cents under when sending over your check! (The right money is preferred.) (Stateside Novice license holders are not able to gain a reciprocal license with Australia.)

Our DOC has a policy of giving all possible aid to overseas amateurs wanting reciprocal licenses, but being a government department, they must abide by government policy.

The preferred method of granting licenses to overseas amateurs is for you to present your current amateur license (or certified copy) at any branch of our capital cities' licensing departments and your VK reciprocal license will be handed over the counter to you with only a five-minute delay.

Another way to go is to get one of your VK on-air friends to get it for you, if he lives near one of our major cities. I am told by the DOC that they will issue one to him for you, providing all the paperwork is correct.

I know that the last thing you want to do is chase after a license when on holiday, but providing it is not the weekend or a local public holiday, the appropriate department will be open during normal working hours and will be only too pleased to issue a reciprocal license over the counter.

There is a good case for an International Amateur License, but with all the different grades plus ever-changing licensing criteria throughout the world, what an administrative headache this would present! I feel that we amateurs would have to pay, in the end, one way or the other, for this privilege.

VK9L—LORD HOWE ISLAND

There have been many requests to our DOC over the years to correct the anomaly that existed with the Lord Howe Island callsign, as it had separate country status but still retained the VK2 callsign. You can imagine that this did cause some confusion to overseas stations, unless the station operating signed "Lord Howe Island."

This has now been remedied by our DOC issuing a new block of call letters, VK9LA to VK9LZ. This should make it easier for overseas stations to recognize this call in the future.

The "Down Under DXers' Club" operated last year from Lord Howe Island as VK2LHI with great success. They have stated that they will try to activate this DX spot on a regular basis, at least twice a year during contest operations. As a result, this one should finish very low on the DX Most Wanted List in the near future.

Dick VK2AGT, a permanent resident on Lord Howe Island, is now VK9LH, while the new call for Ken VK2BKE, the other permanent amateur resident, is unknown to me as yet. Ken is well known as a Morse-code instructor for the VK2 division and often takes the on-air slow Morse sessions for this division on 3.550 plus or minus QRM at 09.30 UTC.

BRAZIL

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20000 Rio de Janeiro, RJ
Brazil

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20270 Rio de Janeiro, RJ
Brazil

MARCONI OR LANDELL DE MOURA?

Guglielmo Marconi is known all around the world as the first man who made a wireless transmission—it happened in 1896. Meanwhile, three years before, in 1893, Roberto Landell de Moura, a Brazilian priest father and a researcher of electrical phenomena, succeeded in transmitting wireless phone signals for about eight kilometers in the city of Sao Paulo. It took him a lot of studying and experimenting without any help and using only poor apparatus he had at home.

Due to his humility, this event was not spread out for the world that time, and it is still unknown except for us Brazilian operators for whom he represents the beginning. You may be sure that it was a Brazilian before Marconi.

CELSO BUSS PY3CB

With deep regret we record the passing of Celso Buss PY3CB (ex PY3APH), one of the most well-known DXers of Brazil. Very young, 44 years old, Celso achieved many awards (one of the first in Brazil to get the Five Bands DXCC, DXCC Honor Roll, etc.), and, above all, was a very kind and charming person.

CECW AWARD

Sponsored by the CW group of the state of Ceara, the CECW award is available to all licensed amateurs for confirmed contacts with five PT7 stations. Among them, three must be CECW members. Contacts must have been made after September 1, 1983, on any amateur band. Only two-way CW mode. No QSLs. Send GCR list of stations worked (call, date, time, band, mode, and report) and 10 IRCs for mailing expenses, to CECW Award, PO Box 546, 60000 Fortaleza, CE, Brazil.

CECW members: PT7s AA, AC, ADC, AI, BTO, CG, EQ, HP, NK, ON, QR, WA, XO, YS, ZD, ZP, and ZZ.

de PY1APS

BRAZILIAN LEAGUE AWARDS

Brazilian Radioamateurs League (LABRE) sponsors four very interesting not-so-easy-to-get awards, encouraging interest in Brazilian areas, American areas, and Atlantic Ocean areas. You can judge yourself and join the fun of them all!

The *WAB (Worked All Brazil) Award*—available to amateurs confirming QSOs with Brazilian stations in all states and Brasilia City, PT2. Special ribbon to confirmed QSOs with Federal Territories of Amapa, PY8 (ex PU8), and Roraima, PV8.

The *WAO (Worked Atlantic Ocean) Award*—available to amateurs confirming QSOs with all 9 Brazilian geographic regions and 21 countries of the Atlantic Ocean. *First Region*: PY1/PP1, *Second Region*: PY2/PP2/PT2, *Third Region*: PY3, *Fourth Region*: PY4, *Fifth Region*: PY5/PP5, *Sixth Region*: PY6/PP6, *Seventh Region*: PY7/PP7/PR7/PS7/PT7, *Eighth Region*: PY8/PP8/PR8/PS8/PT8/PV8/PW8, and *Ninth Region*: PY9/PT9/PY0.

The *WAA (Worked All America) Award*—available to amateurs confirming 45 (forty-five) countries in the American geographic area; one of them must be Brazil.

The *DBDX (Brazilian DX Award)*—available to amateurs confirming QSOs with a minimum of 20 (twenty) different countries on the official DXCC list; one of them must be Brazil. Contacts must be on 160, 80, or 40 meters.

Special stickers allowed for additional countries in groups of 10. There are three kinds of certificates: only phone mode, only CW mode, and mixed (phone/CW operation).

All stations must be contacted from the same country. (Only exception when a station moves to another call area or country within a radius of 150 miles from initial location.) Only land stations accepted; no air or maritime mobile accepted.

Contacts are valid over any period of years, with same station license even if with different call letters. Logs with all data as in QSLs, checked by applicant's Award Manager or by two licensed amateurs. All applications must be sent, enclosing 10 IRCs for handling and postage, to LABRE Awards Manager, PO Box 07-0004, 70000 Brasilia, DF, Brazil.

Note: Since March, 1984, PU prefixes identify class-C operators in Brazil, and the PU8 call for Amapa Territory has now changed to PY8. Only PU8 GAA to IZZ calls identify new class-C operators from Amapa. Before then, Amapa's QSLs are considered valid PU8 calls for LABRE's award.

CZECHOSLOVAKIA

Rudolf Karaba (OK3KFO ARC)
Komenskeho 1477
955 01 Topolcany
Czechoslovakia

AO-10 IN CZECHOSLOVAKIA

At the beginning of January, 1984, after an operating pause devoted among other things also to the improvement of sets, Ondrej OK3AU resumed his satellite operation which he certainly did not regret being able to do. The number of nice DX contacts with FK8CR, KH6IBA, VK3ZL, W1BIH/PJ2, JR6UPU (Okinawa), VS6HI, and FR7CC was increased in his log. An interesting additional station was LA2PH/MM, with Ken, who had sailed his ship *M/T Thorsholm* for A6X (The United Arab Emirates) and during his contact he found himself not far from C9 (Mozambique). In the second half of January, the expedition LU2A from the South Orkneys was working under the callsign AZ5ZA (SSB). Ondrej also heard the following (operating SSB): VP8NO, JY1, TI2NA, TU2IT, 4U1ITU, EA8JJ, Z25JE, and HL9FZ. The biggest DX was the reception of ZL2 (New Zealand) that is at the very boundary of the communication range AO-10. At the end of January, Ondrej had added up 52 DXCC countries from all six continents.

At AO-10/B another Czechoslovak station appeared, at last. It was Mirek OK1DMS from Marianske Lazne.

★ ★ ★ ★ ★

New records and new countries in the VHF and UHF band:

● A full use of extraordinary conditions created by a sporadic E layer in June and July last year was made by Jenda OK2BFH, who made contact with more Spanish stations, but also with 9H1CD, CT1AUW (his new country) and especially with EA8XS on the Canary Islands. EA8XS represents not only a new country for OK-land and OK2BFH personally, but also a new Czechoslovak record in the category of propagation by means of a sporadic E layer, 3757 kms, on 16 July 1983.

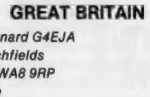
Jenda was also successful with Perseides contacts; in August, 1983, he had advance non-agreed contacts with SM2ILF, SM3JAW, SM3KJO, and agreed contacts with LA6CU and UA1MC, the last one enduring for 20 minutes with the intensity S9 for up to 3.5 minutes at a time.

● OK1AIY successfully made full use of a license for the 1296-MHz band obtained since 1 July 1983, and as our first station he made contact on the above-mentioned band on 13 September 1983 with Y23FL/P in the German Democratic Republic. Y23FL/P, who is in locator HK14c, made use of a 10-mW and a 15-element yagi. Pavel had a 4 × 15-element loop yagi, 20 Watts, in locator HK26c.

● OK1KHI certainly cannot complain of tropospheric conditions in the second half of October last year. On the 22nd and 23rd the station made 375 contacts from Snezka ranging from EI (Ireland) to UA3 (European USSR) on the 145-MHz band, 78 contacts on the 433-MHz band, the first contact from OK-land with GI4GVS, GU6EFB, and EI6AS—the last one 1525 kms away. Twenty-seven contacts were on the 1296-MHz band, the longest one with G4CWB at a distance of 1257 kms.

● OK1CA had bad luck because he arrived at Snezka on October 26th, but in spite of that he made 16 contacts on the 1296-MHz band, the longest one, 1089 kms, being with G3LTF. On the other hand, on October 28, 1958, he had good luck meeting OK1VR in Snezka who came 25 years earlier after he had broken a long-lasting Czechoslovak record of 1518 kms on the 145-MHz band by contact with GI3GXP.

● Radio club OK1KIR was very successful in the first part of the EME contest that took place on October 29 and 30, 1983. Operators had been working on the 433-MHz band with JA6CZD, OE5JFL, DL9KR, HB9SV, G4EZN, YU1AW, OH6NU, N4GJV, HB9G, W0RRY/5, N9AG, G3LTF, OE9XXI, SM3AKW, K2UYH, I5MSH, DK8MA/P, and on the 1296-MHz band with OE9XXI, K2UYH, OE5JFL, G3LTF, W7GBI, LX1DG, DF0EME, WA8NLC, and YU1AW; even ZL3AAD had been heard.



GREAT BRITAIN

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Widnes WA8 9RP
Cheshire
England

THE UK SCENE

Most of you probably know that UK amateurs are not allowed to handle third-party traffic. Until recently, the only chink in the authority's armor of anti-third-party traffic handling was in provisions for emergency message origination. Even to do this, though, requires a typically British bureaucratic procedure. An amateur may pass emergency or life-saving traffic only at the request of a designated official.

In theory, then, a public-spirited amateur equipped with, say, 2-meter mobile gear and coming across a serious traffic accident cannot legally request another amateur to QSP a message to the emergency services. In practice, of course, any self-respecting amateur would do everything he could to alleviate the situation he found, and normally the authorities would turn a blind eye (wouldn't they look silly prosecuting in such a case?).

Anyway, there are now some further signs that the days of restrictions on third-party traffic may perhaps be numbered. Non-amateurs may use a licensed station under supervision to pass greeting messages, but only to another station within the UK. The other station may be similarly manned. This provision is aimed at events such as the Jamboree On The Air (JOTA) which is always a popular and well-supported event in the UK. In the 1983 JOTA, some 13,000 Scouts and Guides (Girl Scouts) took part worldwide including no fewer than 455 UK stations.

JOTA contacts from the UK were made with some 50 other countries on HF and via OSCAR 10. There can be no better introduction for youngsters to amateur radio than via their scouting activities. This has been the case for many years but now the Scouts and Guides have the opportunity to use the microphone themselves, albeit for only limited greetings messages.

The Scout headquarters' JOTA station, GB2GP, was officially opened by the chairman of local Epping Forest District Council, who used the greetings message facility to swop felicitations with another civic dignitary, the mayor of Northampton, who opened another JOTA station, GB2NDS, at the same time.

There can be little doubt that being involved in an amateur-radio transmission is far more likely to promote a spark of interest than just watching somebody else. When this interest comes from an elected local representative, the whole amateur movement stands to benefit. Amateur radio is often misunderstood, misquoted, or confused with CB, or just dismissed as boys playing with radios. Any opportunity to demonstrate the finer points of the hobby to others should not be missed.

I was recently the after-dinner speaker guest for a local Round Table (known as Active 20/30 in the US) and I chose to talk about the Amateur Radio Service with the emphasis on service. It never ceases to amaze me how little most people understand of the technology associated with radio and of the part played by amateurs. A demonstration of handie-talkies, pocket-sized HF receivers, OSCARs, and pictures of the space shuttle tends to bring a few glazed looks from the audience but they never again dismiss hams as cranks.

When giving such talks I try to keep away from too much in the way of technicalities and jargon and tend to concentrate on shortwave listening. This is for two reasons—first, it is easier for the uninitiated to follow, and second, it is something the man-in-the-street can easily take up for himself with little outlay and no technical knowledge. How many times, though, do you see demonstration stations at fairs, festivals, and the like, working stations lost in the noise and using nothing but Q-code jargon? We all like to work DX, but when trying to interest the public, a little clarity and plain English will go a long way.

I was in Italy on holiday during World Radio Amateur Day in April. I thought it would be a good idea to take a handie-talkie just to listen to the local 2m traffic (I had no time to apply for a reciprocal license so was not intending to transmit). Despite protests from the XYL about the extra weight, the IC-2E went into the case with a freshly-charged battery pack. When I first decided to use it, 2 days into the trip, I found I had left it switched on! There is a moral to this story, but you must have guessed it by now!

SV1PL inside...

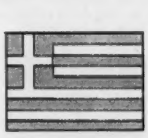
My little vest-pocket stereo FM radio from Toshiba does not cover 2 meters, of course, but the number of band-2 stations around Naples is almost as many as around LA. At least there is the US forces network on 104 MHz which has excellent coverage of the Naples Bay area and is in English (my Italian is rather limited)!

A few days ago I visited Communications 84, the biennial trade exhibition and conference at the National Exhibition Center near Birmingham. It is primarily a showcase for manufacturers of commercial telecommunications gear including switchboards, modems, multiplexers, and so on. This year two particular themes seemed to dominate.

First, a rash of products was aimed at catching the eye of the consumer recently freed to buy his telephone anywhere. Until last year all (legal) telephones and extensions had to be rented from British Telecom. Now, with liberalization, the consumer can buy additional approved instruments from whomever. Needless to say, the UK market is now flooded with telephones from just about everywhere and in just about every shape. (The Mickey Mouse phone I brought back from the US a few years ago has lost its conversational appeal all of a sudden!)

Second, the personal-computer market continues to believe that nobody can survive without communications. Every respectable PC has at least one modem and a local-area-network connection for bulletin boarding or electronic mail. (Or at least that's what the salesmen would have us think.)

Also at the show were a number of exhibitors of specialized or military hardware. They were showing ruggedized HF receivers, backpack radios, Morse decoders, and the like. In every case their demonstrations were tuned to amateur broadcasts. It was most encouraging to see a crowd of professional communicators around a stand watching a CW QSO displayed on a screen.



GREECE

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Continuing the presentation of some SV DXers, this month we have Angelo SV1PL.

But before that, I would like to point out something which I thought of just a few hours after last month's column was traveling to *73* headquarters. What I was trying to say is that HF is not the only place where DXing is taking place. With the tremendous range of AMSAT's new bird, two meters offers a lot of DX now. Besides

...and outside.

that, working with sporadic E openings or meteor scatter or even tropo and aurora can give DX contacts which are equally worth the ones on the HF bands. Therefore I will be more than happy also to present through this column a number of people working above 50 MHz.

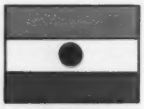
Back to Angelo, now. SV1PL is situated in Marousi in the northeast part of Athens city. Angelo, who is now 34 years old, got his ticket some three years ago, and from the first he was attracted by the HF challenge. Starting with a Kenwood TS-130, he played around for some time with dipoles, verticals, and the like, but after understanding it was a waste of time, he moved to a Hidake three-element beam.

Anyway, he was learning quite fast and after his first year of amateur life, he started to take part in contests and to collect diplomas.

Today, SV1PL has 245 confirmed SSB DXCC contacts and is looking for more. His station consists of the same TS-130, an RF Power Electronics antenna tuner, and an HB443DX-4 four-element, four-band beam antenna from TET. On the low bands Angelo is using an HF5 from Butternut. On the other bands he has the FT-480R and FT-780R from Yaesu (very popular in Greece) for 2m and 70cm respectively. The antennas for those rigs are a 16-element and 19-element F9FT, both of them horizontally polarized.

Finally, there is also a TRS-80 Model I Level II computer equipped with Macrotronics interface and software for RTTY and CW and many other amateur-related programs.

So if you hear SV1PL on the air, do not hesitate to call him; even if you greet him in Spanish or French, he will answer back.



INDIA

Major T. A. Ramakrishnan VU2TN
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Clara, 5-B, Versova Cross Road
Andheri West
Bombay 400 058
India

GOODNESS IS GRACE!

Whenever you listen to the activity on the 20-meter band, especially around 1530 or so, you will find a regular activity on the DX horizon from India, on 14150 kHz. If you listen carefully and if the few hundred "Uliannas" permit you to listen, you will hear a net in progress. Most of the days, this net would be conducted by a YL. The YL whose voice you will hear is Grace VU2AIG.

Grace and her OM, Dasan VU2AID, are devoted hams in India. They operate from Bombay, and to them hamming is a very important part of their life. Not just working DX or chasing the rare ones, but in being part of the national emergency network, the Airnet-India, which, incidentally, has its own callsign, VU2NET.

With Julia, their only daughter, away at Patna practicing as a doctor, being also a ham (VU2AIJ), this family is a total ham family, with a great determination to carry on the great work of rendering relief to the needy through ham radio.

With only about two years' "driving license" at the mike, you will find Grace a really wonderful person to meet, both on the air and in person. Ever helpful, Grace is goodness itself and goes to any amount of personal troubles to help out the many patients in VU-land who need medicines which are just not available in that country and have to be brought in from outside. Incidentally, the Airnet-India has this unique service offered to the country; there are at least a few hundred families around India who are grateful to Grace for saving the lives of their near and dear.

Grace VU2AIG outside...

It works like this—after the net is called, any ham who has a need for medical assistance lists the medicine needed, its source, and the country of origin. Grace then contacts the few sources in DX either by landline or by other means and passes on the requirements to the most likely source. The medicines are procured and put on the next flight to Bombay, and either Grace or OM Dasan collects the same (sometimes even at midnight) and arranges to put the medicines on board the next internal flight. The medicines are collected by the Mr. Needy Ham, who is informed on the air, again through the Airnet-India. Thanks to the wonderful cooperation of the Air India and the Indian Airlines, lives dear to someone are saved.

When she is not busy with her household chores, you will find Grace working DX mostly on the 21- and 28-meter bands. I will bet that you receive her QSLs faster than you post yours, since she QSLs all contacts direct and feels that QSL bureaus are very tardy—so, in case you do want a QSL from Grace, better do it direct!

To keep her active, she has a wonderful shack—HF is covered by a TS-930S, TR-7, TS-430S, and a veritable antenna farm with a three-element beam, a two-element quad, a Butternut vertical, and a number of dipoles which help put a really FB signal out of Bombay. VHF is catered to by a whole lot of equipment with exotic antennas. The shack has minor details like an Apple II computer, a Robot terminal, a word processor, and all the monitoring equipment which would make the shack look like an Indian branch of Radio Shack, indeed!

Unlike many ham families, OM Dasan is a home-brew fiend and thus Grace has all the time to be on the bands. She would like to get her DXCC and has already collected 65 confirmations and is looking forward to the balance. So, in case you have contacted her, do send in your QSL!

While not on the air, Grace, an accomplished pianist, loves to play Chopin and Tchaikovsky. She is also a qualified teacher and thus has endless patience in listening to endless monologues. But most of all, as I said, she loves to help any friend, any ham; thus, as the title reads, goodness is Grace!

...and inside.

ISRAEL

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Israel

THE NEW BANDS IN ISRAEL

In late 1982 the Israeli government ratified the 1979 World Administrative Radio Conference allocations for the new amateur bands. Nearly a year and a half has passed since then, when your faithful reporter made the necessary changes to activate his rig on these bands, loaded his longwire, and gave them a try. The following is a combination of official information, personal experience, and details gleaned from other amateurs.

10 MHz

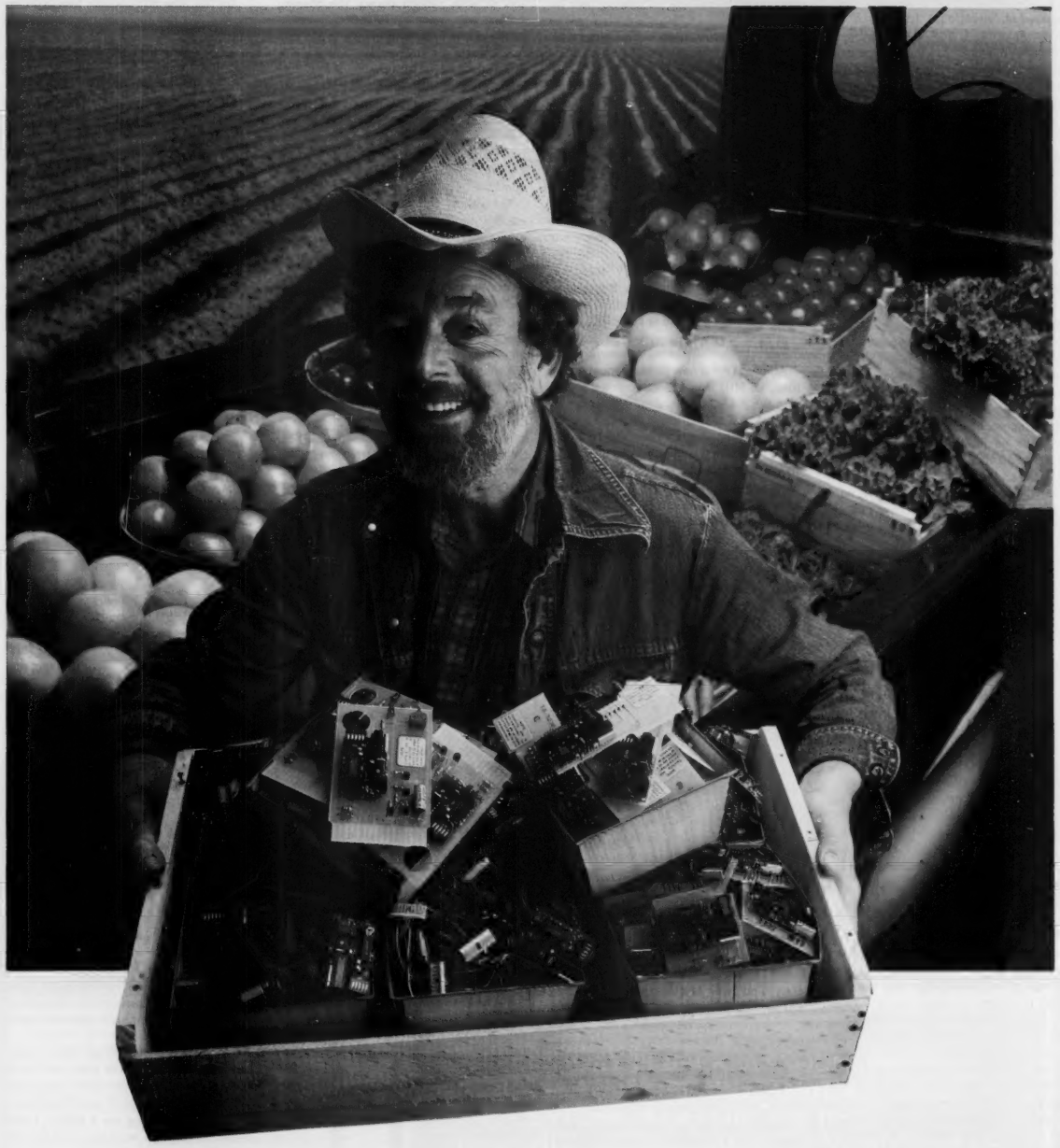
This is by far the most promising and active of the new bands. As with 24 and 18 MHz, the Class A amateur is allowed 150 Watts peak input while the Class B licensee is limited to 100 Watts. The Class A hams may use 10.100 to 10.150, but the Class B holder is restricted to 10.110 to 10.130 MHz. Both SSB and CW are permitted, not only across the entire band but on 24, 18, and 1.8 MHz as well. Operation must be on a secondary non-interfering basis to the other services that populate this band. There are no further limitations.

You may have raised an eyebrow upon reading that SSB is permitted. The International Amateur Radio Union (IARU) had recommended that only CW be used on this narrow slice of spectrum and indeed most countries permit only Morse operation here.

One Saturday, as our national 40-meter net ended, I suggested that we make a test and requested that everyone with capabilities move up to 30 meters. A dozen stations responded using a variety of rigs and improvised antennas, and we were in the midst of an SSB round table exchanging signal reports and comparing stations. A European station was heard in the background on CW sending "NO SSB," and Vic 4X6GP broke in asking indeed what we were all doing here on SSB. Of course, this was only a test, the band was not crowded, and we were all complying with the terms of our licenses, so Vic was reassured that 10 MHz was not going to be overrun by SSB operations. As it turned out, signals were much better on 40 meters, so we were convinced that this was not the optimum band for local QSOs.

With regard to SSB operation on 10 MHz, Vic told me that during his operations here he had heard only French stations on phone.

How about propagation on 30 meters? An oversimplification is that 10 MHz behaves partly like 20 meters and partly like 40. Actually, skip on this band seems to have a character of its own, but then the fact that most stations here are using low power and unity-gain antennas probably has a bearing on the "feel" of 10 MHz. In a year or so of casual operating, putting out



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a hundred Watts of CW into a longwire somewhat directional to Europe and North America, I worked all continents from JA, VK, and ZS to VE and YV with Europeans being commonplace. Vic 4X6GP and Dov 4Z4DX have had similar experiences.

The beauty of 10 MHz is that with the lower maximum usable frequency accompanying the decline in the sunspot cycle, especially in the winter months when 20 meters is as dead as a doornail, one may still hear DX stations coming through. On one such winter night with the higher bands dead and 40 meters choked with European signals and commercial QRM, I could hear both US and Japanese signals, albeit weak, coming through.

On this side, 30 meters is quite full of commercial stations, most on RTTY, no doubt running considerable power as they really push around the S-meter, while at the same time one may have to crank open the gain in order to read amateur signals. My observations are that there are a few "windows" free of commercial QRM and thus useful to amateurs. They are 10.100 to 10.108, 10.120 to 10.126, 10.130 to 10.133 and 10.142 to 10.150. Look for the DK0WCY beacon on 10.144 to check band conditions. At no time here have I experienced overcrowding, in spite of a few kilohertz actually free.

Some of my contacts on 10 MHz have said that 30 meters is what ham radio used to be like. Digging down in the dark depths of my memory, I must agree. Most stations are using low power, simple antennas, and are good CW operators and gentlemen. There is no overcrowding or bad manners. All this has given me the feeling that a lot of the operators here are experienced hams, refugees from what has become routine on the other bands, who are nostalgically looking to capture the spirit of the "good old days."

So far, the voluntary ban on competition on the WARC bands requested by the IARU has been instrumental in preserving the unique character of 10 MHz. Indeed, it was a wise move to keep the band free from contests and certificate-hunting so that the band could be enjoyed for its own qualities alone.

18 and 24 MHz

After the new bands became available, I fired up on 18 and 24 MHz as well, and to the best of my knowledge was the first Israeli to appear on these bands. I'd call CQ, attract a pileup of Europeans, and work everyone calling until I'd dried up the band, as it were. Many of the stations worked were encountered on the other WARC bands, apparently enjoying the novelty of the situation, as was I.

Although I didn't become a frequent user of those two bands, I did notice a gradual dropping off of activity. It got to a point that in spite of good propagation and crowding on the adjacent 21- and 28-MHz "old" bands, these new ones would seem almost dead with occasionally someone putting out a CQ call for ten minutes or more until enticing a reply or giving up. Thus I gradually lost interest in 18 and 24 MHz until I had all but forgotten them.

One day in mid-April this year, Adi 4Z4VG told me that a day previously he had worked VK6RO on 24 MHz. This was probably the first Israel-Australia QSO ever on this band. As they had arranged a sked for the next day, I checked to see that the longwire would still load and immediately worked F9VK on SSB. He was followed by Tom GW3AHN on CW, who told me that using only a dipole he'd already worked 50 countries on this band. VK6RO did show up for his sked, and he was able to read me on CW but not on SSB.

Some countries have imposed tough restrictions on the use of 18 and 24 MHz. Amateurs in the United Kingdom are limited to ten Watts only and are not allowed gain antennas, so they must stick to dipoles or quarter-wavelength verticals.

Here in Israel, power limitations are the same as on 10 MHz. Class A amateurs may use from 18.068 to 18.168 and 24.890 to 24.990 megahertz while B licensees are restricted to 18.109 to 18.130 and 24.910 to 24.950.

It would seem that these two bands are just barely beginning to be explored. No doubt they have great potential; there are few commercial stations in these segments and worldwide propagation is possible, depending on the season.

1.8 MHz (160 Meters)

Although not a new band for most countries, 1.8 MHz was opened in Israel along with the WARC bands. Grade A licensees may use up to 100 Watts input, 1.810 to 1.850, and ten Watts from 1.850 to 2.000 MHz. The class B boys are sadly limited to 10 Watts from 1.810 to 1.850 alone. More details about the "top band" may be found in my column on Riki 4X4NJ's activities here, in the February, 1984, issue of *73*.

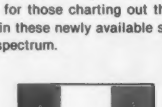
At Riki's prompting, in mid-March I finally put up a proper antenna for 160. I chose W1BB's inverted L that I saw in the Canadian *Top Band News* published by Ivan VE3INQ. This simple yet effective antenna certainly proved itself during a band opening when I worked 25 east-coast US stations, "crossing the pond" for the first time on 160.

Dov 4Z4DX did some serious work here in the last season, and along with Riki and myself, we hope that Israeli stations will become less of a rarity on the top band. Antennas are without doubt the biggest obstacle to getting out on 160; however, in the last issue of *HaGal*, the Israel Amateur Radio Club bulletin, Riki has just had published plans for the inverted-L antenna that I just spoke of. Interest here is rising.

When asked what are the advantages of this band, I reply, "Absolutely none!" No doubt this is what makes 160 meters so attractive—the difficulty and the challenge. Today there is not too much required to get a signal around the world on the higher bands, but to span the globe on one-sixty is no mean feat!

These paragraphs sum up the present state of the new bands as experienced here in Israel. As elsewhere, there is only a small percentage of the hams active on these frequencies. These are indeed some of amateur radio's newest frontiers, and there is a lot of exploring to be done.

It would indeed be interesting to read here in the *73* International column the state of the new bands in other countries. This no doubt would provide useful information for those charting out the propagation in these newly available segments of the spectrum.



ITALY

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IARU CONFERENCE AT CEFALU

The IARU Region 1 conference is over and it is now time to have a small inventory of what has happened. The opening speech was made by PA0LOU, chairman of the conference, with thanks to the Italian Ministry of Telecom and welcomes to Mr. R. Baldwin, IARU president, A. Shalo, secretary of IARU Region 2, and to M. Fujioka, secretary of IARU Region 3. The flag of IARU was presented to the participants by the Norwegian delegates, while a station with the special call, IP9IARU, started working and in 6 days made over 10,000 contacts.

Thirty-three nations of Region 1 attended the meeting with delegates while others gave proxy to participants. The meeting was later split into different committees, each one with different duties.

The elections of the Executive Committee resulted in PA0LOU being president for the next three years, following the 10 years he has already been in that position. Also elected was vice president SP5FM. The secretary has always been English: G2MI first, G6CL later, and G2BVN until his death; G5CO filled the vacancy. Elected now was a new but very well-known Englishman, John Allaway G3FKM. Other members now are YU7NQM, EL2BA, and I1RYS.

Here are a few of the results of all the meetings and of all the talks.

1) Emphasis has been given to the situation of 7.0–7.1 MHz. This band is at the present used by many broadcasting stations while it has been assigned to amateur use. A recommendation to all the participants has been made in order to put pressure on the ITU to transfer broadcasting to other sectors of the spectrum.

2) The Region 1 members are committed to give assistance to the countries (mainly in Africa) where the amateur service is jeopardized by the economic situation.

3) A group in charge of a European common license is working on this subject and will continue the study of feasibility.

4) A recommendation to all the countries participating has been made in order to limit the proliferation of special prefixes and contests. (I do not like it!)

5) The 17th of June has been declared QRP day.

6) The automation of the QSL service in many countries will not in the future allow the use of QSLs not in line with the actual size limits of 9 cm × 14 cm.

7) Each participating country will have to work on the local telecom administration in order to have the AMTOR A & B system of RTTY recognized and allowed.

8) The 10-MHz band must not be used to transmit local bulletins and other association news.

9) During worldwide and local contests, a certain portion of the band has to be left free for normal use by amateurs not participating in them.

10) A coordinating committee on propagation and sun activity has been promoted. The coordinator is Alan Taylor of RSGB.

11) The official language of IARU has been confirmed to be English.

12) Where the 50-MHz band is not open to amateurs, it is recommended that the local league start approaching the authorities in order to obtain temporary permission.

13) The R9 144-MHz repeaters have to be deactivated immediately to avoid interferences with OSCAR 10. All local associations are invited to stop the tremendous increase in the number of FM repeaters. The use of FM below 145 MHz has to stop, and the 145,250–145,475 portion of the band will be used for local FM.

14) The beacon band has been extended to 432.8–432.99 MHz.

15) A band plan for 1.3 GHz has been approved.

16) The new WW-Locator has been approved and recommended for immediate implementation.

17) Distance records verified by VHF managers will be coordinated by SM5AGM.

18) The study of propagation above 30 MHz will continue to be made by the RSGB and F8SH.

19) Rules have been established on satellite activities.

★ ★ ★ ★ ★

April 25, 1874, was the birth date of Guglielmo Marconi, and to commemorate it, a meeting was held near Bologna. In the same room where Marconi made a lot of experiments there is now station IY4FGM, and in a future column I will give a full report of the commemoration.

LIBERIA

Brother Donard Steffes, C.S.C.
EL2AL/WB8HFY
Brothers of the Holy Cross
St. Patrick High School
PO Box 1005
Monrovia
Republic of Liberia

AMATEUR RADIO IN LIBERIA

Amateurs are confirmed junk collectors. To convert them is hopeless. Their wives have learned to accept this fact and live with it.

The modern age with its transceivers that can do everything has not really changed the amateur. He is innovative and is always trying something. And they are so enthusiastic about their findings that they write about them in *73*. What is more, their articles are read. I am going to build the antenna featured in the February issue, page 10. It promises to be exactly what I need for my club station.

When I came to Africa I found myself without a junk box. The realization crept up on me and developed into a real frustration. Every time I needed something, even a little bolt or nut, I didn't even have a place to dig for it. I wrote to an old friend in the States and asked him to please send me some junk. He did. He sent bolts, nuts, and washers. He sent coils, capacitors, pots, all sorts of things. It was well worth the shipping cost.

It took me two years to get what I would call a working supply of junk. One local company retired an outmoded computer. Another company rebuilt its whole electrical system. Since we are a school, I was invited to salvage whatever I could use. Well, I had a field day! I hauled home relays, meters, transformers, motors, piles of circuit boards, wire of all sizes and shapes, and all sorts of nice things. I am still in the market and looking for whatever I can get but I am reasonably comfortable and happy.

Last week one of my friends here found himself off the air. His power supply had blown two high-Amp voltage-regulating transistors and a high-Amp bridge circuit. The parts store had substitutes for the voltage regulators and my junk box supplied four high-Amp diodes and a heat sink. The radio is back on the air and the radio doesn't even know that its power supply has makeshift parts.

This is the time of the year when I teach budding amateurs, both young and old. To liven the class and bring life to some of the dull theory, I went back to the junk box. I made a spool with two blocks of

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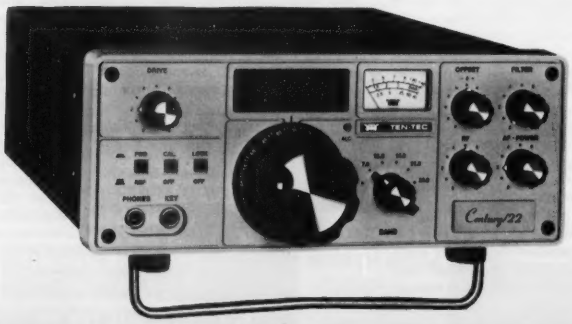

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wood and the core form from two rolls of toilet tissue. (These amateurs will find a use for just anything.) I wound on several hundred turns of hook-up wire salvaged from a computer cable. I tested it and added turns until the current from a 120-volt-ac line ran about twenty-seven Amps. When I inserted a solid bar of iron, as shown in the diagram, the current dropped to fifteen Amps. This was not satisfactory at all so I made a laminated core out of some 25 horizontal layers of lengths of steel banding which came to us on shipping crates (sandwiched between more layers, vertically). I taped it together with plastic electrical tape. With this core through the coil, the current was not even measurable with the meters that we have.

I wound a doughnut-shaped coil with about 35 turns and soldered a flashlight bulb across the ends. I then cut a couple of solid-copper and solid-aluminum rings from a piece of pipe (in each case) and with these materials I went to class. The total cost of my "Gee Whiz" show was zero, but the students thoroughly enjoyed it. They saw the laws of physics in action.

The coil with its iron core is a basic transformer primary. The differences in current drawn by the coil with no core, with a solid-iron core, or with a laminated core illustrate one of the factors that affects transformer efficiency. If the core is set so that it extends five or six inches above the coil, it will throw off a copper or an aluminum ring (Lenz's law). If you hold your hand over the core so that the ring cannot escape, it will float in space and get hot. It is now a short-circuited secondary. The coil with its bulb constitutes a secondary with a load. The bulb will glow more and more brightly as the coil is brought nearer to the primary with its core. For an added attraction, drop the whole doughnut coil with its bulb into a beaker of water. The bulb will glow under water if the beaker is set on the primary coil.

This is just a start. With a small iron pan you could fry an egg or boil water in this changing magnetic field.

There are those who say that amateurs, with the advent of the modern integrated circuits, have lost the old spirit. They are wrong. The amateur will always have his junk box and his workshop. Today some amateurs are building an OSCAR and some of the rest of us are building new antennas or fixing power supplies.

MEXICO

Mark K. Toutjian XE1KMT
Apartado Postal 42-048
06470
Mexico, D.F.

I recently got back from a business trip to New York City and was very pleased to have met quite a few colleagues (ham operators). Especially interesting was my visit with the Bridge Radio Club in Brooklyn, at Watchtower Headquarters! Things are really booming for our friends up there in the far north!

Here in Mexico City, rumors are that a new repeater is being (or has been) installed and that a new radio club is being formed. I'll have to get back on the ball and get facts for you, especially if you are planning a trip to Mexico in the near future.

Plans had been made for an expedition to the volcanoes here near Mexico City for the beginning of this year, but my trip to New York got in the way and plans are underway again for our DXpedition through the Paso de Cortez which goes right between the two volcanoes—their names being Popocatepetl (5,452 meters high) and Iztaccihuatl (5,386 meters high). Date of expedition: September 1 and 2, 1984; frequencies: 28.591 (10 meters), 21.375 (15 meters), and 14.307 (20 meters). You probably will find me on frequency (on any of the above settings) all day and all night!

Again I would like to remind our Mexican readers to please rush me any information on current events in their local areas, so as to keep *73* readers informed. To me it's exciting to be able to be part of an expedition or special occasion without even having to leave my home!

It was a pleasure to receive a copy of the Spanish edition of *QSL* right from Spain! Wouldn't it be nice for Wayne Green to entertain our Spanish readers! Imagine *73* in Spanish! I wouldn't mind doing some translating for him myself. It would be worth the effort so as to have top-class technical reading in Mexico and other Spanish-speaking countries! For those who would like information on a Spanish subscription to *QSL*, write to *QSL*, C/. Jerez, 3–Madrid–16, Spain.

I have to apologize to readers for the slight period of no articles due to my recent trip out of the country, and to those who wrote me, such as W0OX, N0FFU, KA0FPJ, and many others. Some asked for information about obtaining a license here in Mexico while on vacation. (Please see my earlier columns with detailed information on this.)

Any of you who would like to contribute ideas for my expedition between the two volcanoes and future expeditions, please contact me immediately. Perhaps you may have ideas for equipment or rare antennas for 2 meters, 10 meters, 15 meters, and 20 meters. Any information will be appreciated.

So, as we say down here south of the border, Hasta pronto amigos! Mucho 73 y DX!

NEW ZEALAND

D. J. (Des) Chapman ZL2VR
459 Kennedy Road
Napier
New Zealand

Chatham Islands, ZL7, are composed of two main islands, Chatham and Pitt, and a number of smaller islands. They are located about 850 kilometers from the New Zealand mainland. Chatham Island, the main island, is about 50 kilometers long and has a large lagoon stretching about half its length. Half of the total population of approximately 740 lives in or around the main township of Waitangi. The main industries are farming, fishing, and the associated processing works for these activities.

Amateur-radio activity from Chatham Islands varies, as there are not many permanent resident hams there; most of the amateurs active there are members of the Post Office Radio Station staff who work on the island for specific periods of one or two years' duration. Occasionally an amateur is sent to Chathams for relief purposes, and such a temporary residence is of a shorter period. In this category are Allan ZL2BKM/C (his first trip was in 1983) and ZL7BKM, relieving radio operator for about three months from late May.

The Post Office Radio Station provides varying radio services which include maintaining a 24-hour radio watch on the international distress frequency, 2182 kHz. It routinely broadcasts weather and coastal information and traffic lists to shipping and transmits and accepts telegrams from ships. The station also provides an Aeradio service, air-ground and point-to-point circuits for the Civil Aviation Department. It handles inland telegraph transmitting and receiving, with Gentex offices on the mainland, and Radphone, the radiotelephone link with mainland New Zealand, carrying all the telephone traffic between the islands and the mainland. Radiotelephone messages are "scrambled" en route to maintain confidentiality.

Land mobile, ZLC, the Chatham station's callsign, is the only New Zealand radio station that monitors land-mobile radio circuits, as most of the islanders have radiotelephones in their vehicles for use in case of an emergency. The other service the radio station provides is also unique for a radio station. ZLC provides the night telephone-switched subscriber service which gives the telephone subscribers an emergency facility outside the telephone exchange hours, as the radio station is staffed 24 hours continuously. Anyone requiring assistance can ring in from any one of a number of specified telephones around the islands which are night-connected to the radio station where the watch operator looks after the telephone call.

The Post Office first came to the Chatham Islands in 1856, the mail service being by sea "as opportunity offers." About 1888, when a regular shipping service commenced, this gave a hint of regularity to the mail service. From that time the Post Office offered only a limited service to the residents of the island, until a telephone exchange was opened on the island in 1962.

The radio station was first established at Chathams in September, 1913, with all traffic handled on a radiotelegraph basis. A radiotelephone link was opened between the mainland and Chathams in May, 1953, and in the early days of the radiotelephone link, subscribers had to attend the radio station to make and receive their telephone calls from New Zealand. In August, 1965, the Chathams were linked to the New Zealand Post Office toll system, and subscribers were, from that date, able to make all their toll calls from their homes or offices.

The Chathams group of amateur operators includes Lester ZL7PO, the manager of the N.Z. Post Office Radio Station, Chris ZL7OY, a County Council employee, Ian ZL7TKI, a Works Department employee, and Dave ZL7PA, Tai Rio ZL7TZ, Stephanie ZL7BJE, and George ZL7BSQ, all employees of the Post Office, many of them at the radio station.

BITS 'N' PIECES

Ron Badman ZL1AI, a New Zealand Post Office engineer from Hamilton, has in his spare time designed and built a device to assist visually-impaired amateur operators and listeners. Ron's device is a voice readout which announces the exact frequency on the tuning dial to several decimal places. Similar in principle to a talking clock, the device links a speech-synthesizer chip with the necessary circuitry to convert the visible readout information into sound. The voice chip and the necessary electronics are mounted on a circuit board and installed inside the rig or receiver. The prototype was installed in a Kenwood R600 receiver with a button to activate the readout, which sounds through the same speaker as the audio output.

The device has attracted wide interest in the amateur field, and several of the speech-synthesizer frequency readouts have been made by a Hamilton group for use by some of the estimated 30 or so blind amateur-radio operators in New Zealand.

ROSE CITY CONFERENCE

The 58th Annual NZART Conference and Convention was held at Palmerston North over the weekend of June 3–5 and was called the Rose City Conference because the host city is known as the City of Roses. The host for the weekend conference was a Combined Committee from the Central Districts Branches of NZART consisting of representatives from the Marton, Manawatu, Feilding, Pahiatua, and Dannevirke branches, assisted by members from those branches also.

The Conference was opened on Saturday by ZL1MU, Air Vice-Marshall David M. Crooks, OBE, Chief of Air Staff, Royal New Zealand Air Force, after welcomes were given to delegates and members of NZART from the President Don Mackay ZL3RW and the Palmerston North Mayor, Mr. Brian Elwood.

Amongst the special guests were Dan Wilkenson ZL2AB, who holds amateur license number 2, is the oldest amateur in ZL, and is still-active on the air. Dan has been active in amateur radio for 61 years and has held the same callsign for the whole period. Another special guest, Jim Smith KA7APJ from Seattle, Washington, has attended NZART conferences before and is almost a ZL now that he holds the callsign of ZL2BOR. I understand Jim also will be contributing to New Zealand land tax funds now that he has become a landowner "down under."

Amongst the weekend activities, besides the usual domestic conference business sessions on Saturday, were meetings of the various sections of NZART on Sunday. In all there were 320 ZL registrations and one overseas visitor; this would be about 250 amateurs and their partners. Trade displays were featured from the local agents of Yaesu, Kenwood, and Icom, as well as some ZL firms, Southern Cross Electronics, AWA, Tricity House, Ryel Electronics, and Roz Craft Quads.

Amongst the Certificates of Merit awarded by NZART Council before the conclusion of the business sessions was one to Ian Ashley ZL1AOX, an AMSAT member, for his work as an AMSAT Ground Command Station for the Phase III series of craft. The "Stirers Award" (for the delegate who debates the most contentious points) went to ZL2AUS, the Wanganui delegate.

Next year's NZART Conference, the Garden City Conference, will be held in Christchurch, the Garden City on New Zealand and capitol of ZL3 land in the South Island. All the conference activities will be at the Canterbury University Ilam complex, with displays, technical lectures, discussion groups, and trade displays, besides the usual business sessions of NZART and its associated bodies, the Old-Timers Club, Women Amateur Radio Operators, Amateur Radio Emergency Corps, AMSAT, VHF Forum, etc.

NZART has obtained several pages of *Teletext* free of charge, and amateurs are invited to send in suitable information for inclusion in the *Teletext* pages to *Break-In*, or to Doug Gorman ZL2IY. *Teletext* is reasonably new to New Zealand, and this

Continued on page 104

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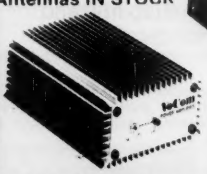

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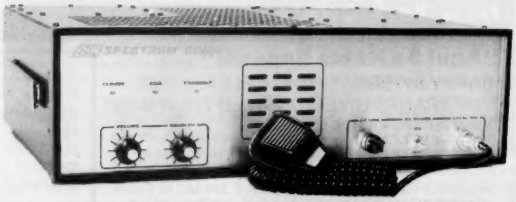

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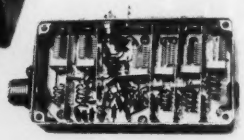

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CONTESTS

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DARC CORONA 10-METER RTTY CONTEST
1100 to 1700 GMT September 1

This is the third of four tests during the year sponsored by DARC to promote RTTY activity on the 10-meter band. Each of the four tests is scored separately. Use the recommended portions of the 10-meter band.

EXCHANGE:

RST, QSO number, and name. US stations also give state.

SCORING:

Each station can be contacted only once. Each completed two-way RTTY QSO is worth 1 point. Multipliers include the WAE and DXCC lists, each district in VE/VO and VK, plus each different US

NEWSLETTER OF THE MONTH

How do we pick a monthly winner in our newsletter contest? What are the criteria? Flashy graphics? Length? A flipped coin? Many editors and club members have been asking just what must be done to get their publication chosen out of the hundreds of newsletters we review each month.

Here's the magic formula: consistency. That's it. This month's winner, *THE GROUND WAVE*, is a perfect example. Month after month, Editor Marv Mahre W0MGI and the St. Paul Radio Club, Inc., put out a quality publication. It's not the longest one we see, or the flashiest, but it's always interesting. It's full of news and reports about the club and its members, complete with revealing pictures.

Look at your club's newsletter. Can it stand up next to *THE GROUND WAVE?* Do your members read it cover to cover or consistently toss it onto the rubbish heap?

To enter your club's newsletter in *73*'s Newsletter of the Month Contest, send it to *73*, Pine Street, Peterborough NH 03458, Attn: Newsletter of the Month.

CALENDAR

Sep 1	DARC Corona 10-Meter RTTY Contest #3
Sep 8-9	ARRL VHF QSO Party
Sep 15-16	Ohio QSO Party
Sep 15-16	CAN-AM Contest—Phone
Sep 15-17	Washington State QSO Party
Sep 15-17	Kansas State QSO Party
Sep 21-23	Maine QSO Party
Sep 22-23	Late Summer QRP CW Activity Weekend
Sep 22-23	CAN-AM Contest—CW.
Oct 6-7	ARRL QSO Party—CW
Oct 13-14	ARRL QSO Party—Phone
Oct 13-14	Rio CW DX Party
Oct 13-14	Columbus Day International DX Contest
Oct 13-15	Oregon QSO Party
Oct 13-15	Rhode Island QSO Party
Oct 20-21	Jamboree On The Air
Oct 20-21	Worked All Y2 Contest
Oct 20-21	CLARA Ac/Dc Contest
Nov 3	DARC Corona 10-Meter RTTY Contest #4
Nov 3-4	ARRL Sweepstakes—CW
Nov 17-18	ARRL Sweepstakes—Phone
Dec 1-2	ARRL 160-Meter Contest
Dec 8-9	ARRL 10-Meter Contest
Dec 26-Jan 1	QRP Winter Sports—CW
Dec 30	Canada Contest

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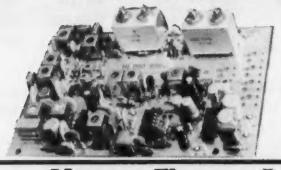

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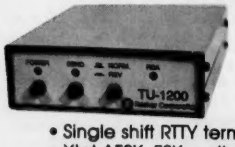

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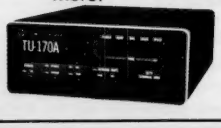

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RESULTS

KE5CV, KD7P/KH2, K3TUP, AND I4KDJ: 1984 WORLD 40-METER SSB CHAMPS

"Big signals from Texas," states VE3NVO. "I made 143 QSOs in an hour!" said WC4E, overwhelmed with all the activity. "An excellent contest...at 24 hours, the XYL can almost stand it!" comments station K3TUP.

The 1984 40-Meter World Championship event is now history. There were some good times and along with that, bad. For the most part, propagation was spotty at best. From the outset, however, persistence paid off for those who chose to stick it out through the wee morning hours. The later in the evening and the earlier in the morning it got, the better conditions became.

From the looks of the scores, stations in Europe and Asia had a field day working each other and had even greater success increasing their DX totals working within their own continents. Stations in Asia seemed to have had better luck working the USA than their counterparts in Europe. Stateside, the same held true. While the DX countries worked were fewer than in years previous, the QSO counts within the States brought new records for some.

Analyzing the entries, over 85 individual DX countries were logged by those participating in the contest. With that kind of support, it is unfortunate that more DX stations don't send in their contest logs—most would be award winners!

In the single-operator category, only 5210 points separated the first and second place W/VE stations. After all the smoke had settled, KE5CV had risen to become the 1984 World 40-Meter SSB Champion. With 1020 QSOs, 55 states and provinces, and 33 DX countries, a total of 473,000 contest points were accumulated. A fantastic job for such rugged conditions—truly a championship class of operation.

The top three stations, KE5CV, KE5IV, and W1WEF, all surpassed the rest of the field by nearly half again as many QSOs. KE5CV and W1WEF each recorded new World-Championship QSO records. W1WEF had more QSOs in his operating class than anybody. Stations with 500 or more QSOs included: W1WEF (1042), KE5CV (1020), KE5IV (953), KAIGG (676), KQ1F (645), KI2G (643), KB5FU (613), NC2Y (613), K1KJT (594), WD8IVL (593), KI7M (585), KD4TQ (562), and K9MWM/Ø (539).

For DX stations, KD7P/KH2 in Guam captured the World Championship in his single-operator class. Propagation stateside wasn't the best, as only 20 states and provinces were accumulated. A total of 470 QSOs were conducted, however, and 36 DX countries were worked for a total of 228,200 contest points.

How do the record performances of this year's single operators compare with records of prior years? Let's look at contest QSO record totals and see how some fared:

W1WEF	1984	1042	W9RE	1982	851
KE5CV	1984	1020	N3AMK	1982	771
VE5DX	1982	972	KA1XN	1982	761
KE5IV	1984	953	WB8JBM	1982	759
KK9A	1982	856	KC5NQ	1983	756

Many stations in the single-operator class managed to work all states. As before in previous contests, Canadian provinces were at a premium. That apparently holds true in all contests, however.

Stations with 50 or more states and provinces to their credit included: KE5IV (57), NC2Y (56), KE5CV (55), W1WEF (55), KB5FU (55), KQ1F (54), K4JPD (53), KA1GG (53), KD4TQ (52), VE3MFA (52), KA7DLV (51), KI2G (50), W4TMR (50), WD8IVL (50), KT1J (50), KVØI (50), and N8CXX (50).

For W/VE contestants, KE5IV, KE5CV, VE3MFP, VE3MFA, and K9MWM/Ø were the only stations with 30 or more DX countries worked. They tallied 36, 33, 32, 31, and 31 countries respectively. For DX stations in the same category, 4U1ITU worked 44 countries, followed by OK1TN (42), EA3CCN (42), PY5EG (41), ZL1BQD (40), KD7P/KH2 (36), LX1JX (32), and JH3TKM (30).

In the multi-operator class of operation, the new World Champion for W/VE stations is the crew from Pennsylvania station K3TUP. Not only did they tally 538,095 contest points, the next to the largest score in the entire contest (I4KDJ had 545,090 points total), but also they came very close to setting a new World Championship QSO record, falling short of their last year's world record by only 18 QSOs. K3TUP worked 1196 stations, 56 states and provinces, and 31 DX countries—these folks were definitely burning the midnight oil, rotating up to 7 operators at the station. A superb job, to say the least.

Compared to previous contests, K3TUP now holds, in his class, both the world record and the second-highest QSO count in the World Championship contest. The top ten are:

K3TUP	1983	1214	KD4TQ	1982	972
K3TUP	1984	1196	W2ZQ	1984	944
K8ND	1983	1129	NW4B	1984	930
N9NB	1982	1098	KYØS	1984	928
K9EC	1984	1008	NA4L	1984	911

Nearly all the North American multi-operator entries worked all 50 states, with Canadian provinces again being the shortfall. Stations with 50 or more W/VE multipliers included: NW4B (57), K3TUP (56), K9EC (55), WA3SPJ (55), KYØS (54), NA4L (54), W2ZQ (54), KS9O (54), WA6PVA (54), KA4RDG (53), KM8U (53), KBØQA (53), KE6WA (52), and W9ZX (52).

Stations in Europe (as can be expected) managed to work predominately within their own continent to build their contest scores. I4KDJ was the world top multi-operator DX station with 638 QSOs, 25 states and provinces, 66 DX countries, and 545,090 points. Unfortunately, this year propagation to the states was almost nonexistent. Following I4KDJ, with 66 countries worked, were OK1KSO (64), DL8NBE (46), NW4B (32), K3TUP (31), and KYØS (30).

Analyzing the contest logs for this year's event and comparing them to those previous, we find some interesting statistics on antennas which will give you an idea how amateurs are equipping their stations.

ANTENNAS USED (%) IN THE 40-METER CONTEST

	1982	1983	1984
Dipole/inverted vee	39.8	44.6	45.6
1/4-wave vertical	13.9	4.8	2.6
Trap vertical	9.3	11.5	4.4
2-element yagi	7.0	9.6	7.0
1/4-wave sloper	4.6	.9	10.6
1/2-wave sloper	2.3	6.7	1.8
Delta loop	9.3	3.8	1.8
2-el. wire beam	2.3	0	2.6
3- or 4-el. yagi	2.3	9.5	15.7
Longwire	0	4.9	.6
1- or 2-el. quad loop	2.3	0	.9
Bobtail curtain	2.3	0	2.6
Other	4.6	3.7	3.8

Reviewing the antenna survey, one can quickly realize the influence of antenna articles which appeared during the past couple of years in major amateur-radio publications. We see a trend moving from the trap vertical to a 1/4-wave type; 3- and 4-element beams are now more dominant than ever before, and because of recent articles on sloper systems, we see more amateurs home-brewing their own, for contesting purposes especially.

As I talked with many of you on the air, it seemed that many plans were made during the summer to erect that new array. I hope you didn't procrastinate as I did. The 2-element yagi never grew that 3rd element nor the additional boom length. With only months to go before the 4th annual event, we all have time to get our systems ready for greater accomplishments. Then again, maybe that 40-meter dipole will do me another year? Meet me on the band in January and we'll find out how well each other's antenna projects panned out. That's January 14, 1985, for the 4th annual 40-Meter SSB World Championship Contest.

In the meantime, you might send for the 1985 rules and contest summary sheets. Forward an SASE to the 40-meter contest chairman, Dennis Younker NE6I, 43261 Sixth Street East, Lancaster CA 93535. See ya on the band!—*Bill Gosney KE7C.*

40-METER CONTEST SOAPBOX

OE1WWL	No propagation to the States this time!
N2EEC	A newly-discovered, fun contest! One I'll support from now on.
W2ZQ	This multi-op station had 27 operators!
VE3DWE	My first contest attempt.
VE3MFP	Disappointed in the activity at first but it sure picked up later, without doubt! Must have been propagation.
VE3NVO	Big signals from Texas during late night and early morning. Wish I had a beam???
WA3SPJ	Propagation not as good as I hoped. The European opening never came. Still the best of the seven contests I enter each year!
K3TUP	This is an excellent contest. At 24 hours, the XYL can almost stand it.
WC4E	Made 143 QSOs in an hour! Wish this contest didn't conflict with the ARRL QSO party.
W4TMR	An excellent contest—had a great time.
KB5FU	5 new countries and 2 new zones including zone 18. Not bad for a few hours' work.
WA6PVA	Very disappointed I couldn't find a Maine station for WAS. The 4-element beam came down 5 days before the contest.
ZS6WB	Thunderstorms—and QRN level of 20 dB over S9 from 1400-1700Z.
KE7C	Heard nearly 50 countries conversing with one another but few were listening crossband in the US segment.
WD8NHN	Hard to work a contest and run a business. Would like to have spent more time on the air.
KM8U	First time for us to work 48 states, KL7, and KH6 all in one night on this band.
JH9EPA	Good contest.
EA9KQ	Poor conditions to the USA.
KG9O	Only worked 4 hours. Had a great time nevertheless. Next year I hope to spend the entire time contesting.

1984 RESULTS
40-METER WORLD SSB CHAMPIONSHIP

Indicated are callsign, QTH, QSOs, states/provinces worked, DX worked, and total score. **World champion; *Certificate winners.

W/VE Single Operator

**KE5CV	—TX	—1020	—55	—33	—473,000
KE5IV	—TX	— 953	—57	—36	—467,790
*W1WEF	—CT	—1042	—55	—23	—424,320
KB5FU	—TX	— 613	—55	—28	—270,995
*KA1GG	—MA	— 676	—53	—17	—245,000
*K9MWM/Ø	—CO	— 539	—49	—31	—239,600
*KI2G	—PA	— 643	—50	—20	—236,250
KQ1F	—MA	— 645	—54	—14	—227,800
*NC2Y	—NJ	— 613	—56	—12	—214,880
*KD4TQ	—KY	— 562	—52	—21	—214,620
*KI7M	—OR	— 585	—48	—17	—207,025
*K4JPD	—GA	— 430	—53	—29	—197,210
*WD8IVL	—OH	— 593	—50	—12	—187,860
K1KJT	—MA	— 594	—50	— 9	—178,770
*W4TMR	—NC	— 390	—50	—18	—140,080
NN4K	—GA	— 406	—48	—15	—132,615
*VE3MFA	—ONT	— 222	—52	—31	—112,050
*KT1J	—VT	— 416	—50	— 1	—106,335
VE3MFP	—ONT	— 236	—38	—32	—102,900
*KA7DLV	—MN	— 328	—51	— 5	— 93,520
*KVØI	—NB	— 336	—50	— 4	— 92,070
K3OX	—PA	— 311	—40	—13	— 86,920
*N8CXX	—MI	— 347	—50	— 0	— 86,750
*KS1G	—ME	— 314	—35	— 4	— 62,405
*WC4E	—FL	— 247	—44	— 3	— 58,750
*WA6FGV	—CA	— 247	—46	— 1	— 58,515
*KG9D	—IL	— 207	—48	— 4	— 55,120
K6EID	—CA	— 175	—42	—11	— 49,820
W3ARK	—PA	— 216	—38	— 2	— 43,600
W8FGA	—MI	— 198	—39	— 4	— 43,430
KN1M	—ME	— 190	—39	— 5	— 43,120
*N7BUP	—AZ	— 148	—43	—10	— 42,665
*WD8NHN	—WV	— 222	—35	— 1	— 39,025
*KA4MTK	—VA	— 192	—38	— 2	— 38,800
*KC7PA	—UT	— 149	—41	— 5	— 35,420
*KY2L	—NY	— 168	—35	— 5	— 34,600
W8UPH	—OH	— 176	—35	— 1	— 31,680
KV9S	—IL	— 132	—39	— 4	— 29,240
W4WIJ	—FL	— 113	—37	— 9	— 28,520
*KA7BRE	—NV	— 126	—42	— 5	— 28,435
N2EEC	—NJ	— 161	—32	— 1	— 26,730
*WBØBHF	—IA	— 132	—38	— 1	— 25,740
W8VEN	—WV	— 132	—36	— 2	— 25,650
VE3DWE	—ONT	— 169	—29	— 1	— 25,500
*K3IXD	—MD	— 114	—35	— 4	— 21,450
*N7EMX	—WA	— 99	—36	— 4	— 20,600
*N5AFV	—OK	— 78	—38	— 3	— 17,630
W6OUL	—CA	— 80	—29	— 7	— 15,660
KA3FKL	—PA	— 61	—22	— 0	— 13,420
KE6PQ	—CA	— 74	—29	— 3	— 12,800
WØIZV	—CO	— 78	—32	— 0	— 12,640
*W5EIJ	—AR	— 69	—35	— 0	— 12,250
*N4JID	—AL	— 69	—32	— 0	— 11,040
VE3NVO	—ONT	— 78	—28	— 1	— 10,920
W9LYN	—IL	— 63	—24	— 5	— 9,860
K1NCD	—CT	— 65	—27	— 2	— 9,715
*KB9S	—WI	— 58	—23	— 1	— 7,080
SMØDRD/W6	—CA	— 56	—25	— 0	— 7,000
KA7AKQ	—WA	— 45	—23	— 2	— 6,000
KY9F	—IL	— 53	—22	— 0	— 5,830
WA3JXW	—PA	— 45	—24	— 0	— 5,400
W6YMH	—CA	— 38	—22	— 0	— 4,400
WA8MJY	—MI	— 40	—21	— 0	— 4,305
VE3FEA	—ONT	— 36	—19	— 0	— 3,420
NM6L	—CA	— 25	—12	— 0	— 1,500
KA2PSW	—NY	— 15	— 9	— 1	— 800
NE6I	—CA	— 11	— 4	— 0	— 220

DX Single Operator

**KD7P/KH2	—Guam	—470	—20	—36	—228,200
*4U1ITU	—ITU/Geneva	—365	— 2	—44	—167,440
*OK1TN	—Czech.	—239	—24	—42	—137,610
*ZL1BQD	—New Zealand	—232	—13	—40	— 90,630
*EA3CCN	—Spain	—157	— 8	—42	— 76,250
*PY5EG	—Brazil	—159	—41	—15	— 49,280
*LX1JX	—Luxembourg	—147	— 1	—32	— 48,345
*JH3TKM	—Japan	—126	— 3	—30	— 41,085
*EA9KQ	—Cueta/Melilla	—114	—16	—25	— 39,565
*ZS6WB	—South Africa	—114	—14	—23	— 37,555
*AL7DX	—Alaska	—175	—21	— 9	— 34,125
*Y33TA	—E. Germany	— 92	— 0	—24	— 22,080
EA7ABW	—Spain	— 88	—20	—13	— 19,140
*DF8ER	—W. Germany	— 82	— 0	—21	— 17,220
*OE1WWL	—Austria	— 54	— 0	—27	— 14,580
*G4IVJ	—England	— 62	— 0	—23	— 14,260
*4X6DK	—Israel	— 59	— 0	—17	— 10,030
OK1KZ	—Czech.	— 48	— 0	—16	— 7,680
EA3ALV	—Spain	— 38	— 3	—16	— 6,935
Y22WF	—E. Germany	— 43	— 0	—13	— 5,590
CT1TM	—Portugal	— 16	— 1	— 9	— 1,550
I4CSP	—Italy	— 13	— 0	—10	— 1,300
JH9EPA	—Japan	— 14	— 3	— 5	— 960
EA3BWX	—Spain	— 11	— 0	— 7	— 770
JA6YBR	(JF6DEA operator) —Japan	— 9	— 2	— 6	— 640
EA3DNC	—Spain	— 10	— 0	— 6	— 600
JHØQNT	—Japan	— 6	— 1	— 5	— 330

W/VE Multi-Operator

**K3TUP	—PA	—1196	—56	—31	—538,095
*K9EC	—WI	—1008	—55	—27	—449,360
*NW4B	—NC	— 930	—57	—32	—433,875
*KYØS	—CO	— 928	—54	—30	—412,020
*NA4L	—VA	— 911	—54	—19	—342,735
*W2ZQ	—NJ	— 944	—54	—15	—330,855
*WA3SPJ	—PA	— 802	—55	—22	—319,550
KA4RDG	—VA	— 836	—53	—19	—309,240
*KSØO	—IL	— 790	—54	—19	—296,380
*KM8U	—MI	— 783	—53	—17	—275,100
*KE6WA	—CA	— 552	—52	—14	—188,430
W9ZX	—IL	— 678	—52	— 3	—187,275
*KBØQA	—SD	— 531	—53	—10	—173,565
*WA6PVA	—OR	— 424	—54	—14	—151,640
*N4EJW	—FL	— 465	—49	—12	—147,925
*N4JII	—TN	— 360	—49	— 3	— 93,600
*N4FKF	—IN	— 295	—46	— 0	— 67,850
*N2EIK	—NY	— 309	—41	— 2	— 66,865
*KE7C	—WA	— 143	—45	—15	— 48,900
*KB7M	—WY	— 108	—34	— 1	— 19,075

DX Multi-Operator

**I4KDJ	—Italy	—638	—25	—66	—545,090
*OK1KSO	—Czech.	—437	—20	—64	—307,020
*NP4CC	—Puerto Rico	—599	—51	—18	—217,005
*DL8NBE	—W. Germany	—378	— 6	—46	—194,220
*HL9FY	—Korea	—105	— 3	—17	— 20,200
*JA3YKC	—Japan	— 53	— 3	—13	— 8,160
*JA2YKA	—Japan	— 18	— 6	— 7	— 1,625

Multi-Operator Participants

N2EIK —N2EIK, WA2KHP, N2DRR
W2ZQ —(27 operators)
WA3SPJ —WA3SPJ, K3WGR, W3UM, WB3CAC
K3TUP —(7 operators)
KA4RDG —KA4RDG, WK4Y
N4EJW —N4EJW, N4EJV
N4FKF —N4FKF, KA9ORW
N4JII —N4JII, NY4N, WC4S
NA4L —(7 operators)
NW4B —(7 operators)
WA6PVA —WA6PVA, WA7QXH
KE6WA —KE6WA, W6SKQ, KF6VK, KF6BC
KB7M —KB7M, KB7WN
KE7C —KE7C, WB7OJV
KM8U —N8AKY, KA8LDO
K9EC —K9EC, AC9C
KSØO —KSØO, KC9XM
W9ZX —W9ZX, N9ECF
KBØQA —KBØQA, WDØCXU
KYØS —KYØS, ADØO, KØUKO
DL8NBE —DL8NBE, DJ9MH
HL9FY —HL9RC, HL9FG, HL9WS
I4KDJ —I4KDJ, I4YNO, I4JMY, I4YSS, I4OUT, I4USC
JA2YKA —JI2NPL, JR2GMC
JA3YKC —JH5EML, JR6NWN
NP4CC —NP4CC, KP4BZ, NP4Z
OK1KSO —OK1JCW, OK1AEZ

state. The final score is the total number of QSOs times the total multiplier.

AWARDS:

Awards to the leading stations in each class with a reasonable score present. Operating classes include: Class A for single or multi-op and Class B for SWLs.

ENTRIES:

Official logs are recommended and are available from the contest manager (SASE or IRCs are appreciated). Logs must contain name, call, and full address of participant. Also show class, times in GMT, exchange, and final score. SWLs apply to the rules accordingly. Logs must be received within 30 days after each test. Send all entries to: Klaus K. Zielski DF7FB, PO Box 1147, D-6455 Erlensee, West Germany.

The remaining contest period is on November 3rd.

WASHINGTON STATE QSO PARTY
0100 to 0700 GMT September 15
1300 GMT September 15 to 0700 GMT September 16
1300 GMT September 16 to 0100 GMT September 17

The nineteenth annual contest sponsored by the Boeing Employees' Amateur Radio Society (BEARS) is divided into 3 operating periods as shown. All amateurs are invited to participate. All bands (except 10.10 to 10.15 MHz) and modes may be used, but no CW QSOs are allowed in the phone bands. Stations may be worked once on each band and mode for contact points and more than once each band/mode if they are additional multipliers.

EXCHANGE:

QSO number, RS(T), and state, province, country, or Washington county.

FREQUENCIES:

Phone—1815, 3925, 7260, 14280, 21380, and 28580; CW—1805, 3560, 7060, 14060, 21060, and 28160; Novice—3725, 7125, 21150, and 28160.

SCORING:

Washington stations score 2 points for each phone contact and 3 points for each CW contact, including contacts with other Washington stations. Multiply QSO points by the total number of different states, Canadian provinces, and other foreign countries worked.

All others score 2 points for each phone contact and 3 points for each CW contact with a Washington station. Multiply QSO points by the total number of different Washington counties worked (39 maximum). There will be an extra multiplier of one for each group of 8 contacts with the same Washington county for all non-Washington stations.

AWARDS:

Certificates will be awarded to the highest-scoring station (both single and multi-operator) in each state, Canadian province, foreign country, and Washington county. Additional certificates may be issued at the discretion of the Contest Committee. Worked Five BEARS Awards are also available to anyone working 5 club members before, during, or after the QSO Party (unless previously issued). All QSO Party entries will be screened by the Contest Committee for possible Worked Five BEARS Awards. Worked Three BEAR Cubs Awards are also available for working 3 Novice members. All BEARS Awards besides QSO Party certificates are handled by Roy Brashear W7RJW, 5711 South 129th Street, Seattle WA 98178. (See page

RESULTS

N4BAA, K1WW, AND ZL1BQD: 1984 WORLD 75-METER SSB CHAMPS

"Great contest," states 4U1ITU. "Sounded like a madhouse over here in Geneva." "The DX was great," says NA4L, who worked some new ones. "Worked all 50 states in one night," crowed W4TMR.

For many, the contest meant getting on for a new state or just adding to DXCC totals. For others, this year's event was nothing short of pure (excuse the expression) blood and guts!

As we compare the scores to those of prior years, you can see, as KI0F stated, the quality of operators—not to mention the quantity of stations heard on the air—is getting better with each and every event. I wonder how many still had the energy to stay up and watch a football game Sunday afternoon? From the looks of the QSO count, it looks like some operators never went to bed at all!

Congratulations to N4BAA, the 1984 World Champion for the single-operator category. I listened to Jose from time to time, and boy, was he ever going to town! You'll note he outperformed Larry N7DF in multipliers, which says he had a definite advantage in working DX countries. Nonetheless, it was a very close race considering that N7DF tallied 1076 QSOs for a new world record for 75-meter QSOs, outdoing N4BAA by 182 Qs! See the stats below. Whew, that's a lot of contacts for 75 meters . . . great job, Larry!

N7DF	1984	1076
N4BAA	1984	894
N5AU (K5ZD op)	1983	777
N8II	1983	730
K0HA	1984	725
KG1E	1983	722
N2NU	1984	722
AD0O	1984	721
N7DF	1982	700
KA1XN	1984	682

W/VE stations this year in the single-operator class with 500 or more QSOs included N7DF (1076), N4BAA (894), K0HA (725), N2NU (722), AD0O (721), KA1XN (682), K0CS (608), KB3A (608), KC8JH (600), KV0I (574), WA1UJU (533), W4TMR (517), and W5VUX (515). The list steadily grows each year as sunspot activity favors 75-meter operation.

In the DX world, hats off to ZL1BQD of New Zealand, who became the 1984 75-meter champion for single-operator DX stations. With nearly 75 multipliers to his credit, Mr. Runciman tallied 137,625 contest points. His score nearly doubled that of second-place finisher EA3CCN of Spain. Like these two fellas, we hope our amateur friends worldwide will continue to support this annual event. We all look forward to meeting you on 75—a lot of us for that first-time contact.

In the multi-operator category, this year's World Champ for 75 meters is Ray K1WW (with KR1V sharing the mike). This New Hampshire station accumulated 675 QSOs and 98 multipliers for a winning contest score of 380,730 points. Only 34 QSOs and 1 multiplier separated Ray and second-place finishers (NA4L and company). While the stats appear close, Ray did manage to work more DX stations, giving him the point advantage he needed to win. Both crews are to be commended!

Not to be forgotten are this year's accomplishments of station K9EC, who finished 3rd place overall. K9EC came within 19 QSOs of setting a new world record for 75-meter multi-operator stations. Refer to the statistics below:

N9NC	1982	793
K9EC	1984	774
K1WW	1984	675
N4TY	1983	655
NA4L	1984	641
KI4DC	1984	629
KS9O	1984	594
KM8U	1984	584
KA4JNC	1983	571
VE2ZP	1982	567

Probably one of the greatest challenges facing all of us each year is our insistence during the summer (some of us wait until it snows) to home-brew still a better antenna than we already have, for next year's event. I'm sure all of us have said it at one time or another. (I guess that's my own guilt coming through since I've been consulting Rush W7RM about a respectable bobtail for 75.)

It seems for this band, however, that the experimenter's instinct has not lost its grasp. From the comparison chart you can see that year after year our contestants favor the inverted vee or dipole, but more and more are putting up various kinds of second 75-meter antennas and giving them a try.

ANTENNAS USED (%) IN THE 75-METER CONTEST

	1982	1983	1984
Inverted vee/dipole	43.8	65.9	38.9
1/4-wave vertical	8.3	11.1	9.6
1/2-wave sloper		2.4	6.3
1/2-wave multi-sloper			5.3
1/4-wave sloper	11.1	5.3	4.2
Phased vertical	5.5	1.1	4.2
2-element wire array	5.5	1.1	9.5
Inverted-L	2.7	2.2	5.3
Full-wave loop	11.1	5.4	5.3
Zepp			4.2
Discage array			3.6
Longwire	7.2	3.3	.9
Bazooka	2.8	1.5	.9
Bobtail	2.0	.7	.9
6-element vertical			.9

Contest certificates have been processed and mailed. Should you have a question regarding the 1984 contest or the issuance of a contest award, contact the 75-meter contest chairman directly. Write Jose Castillo, 1832 Highland Drive, Amelia Island FL 32034.

So it's the end of another World Championship. The 1985 75-Meter SSB Contest is only months away. Mark January 13, 1985, on your calendar. We hope you plan to participate. And please, turn in your contest logs to the contest chairman even if you worked only a few contacts. As you can see from the results, you could be a winner even with a lower-than-average score! Start pruning that sloper; we'll see you in the test!—*Bill Gosney KE7C.*

75-METER CONTEST SOAPBOX

ZL1BQD	Real good contest—keep it up!
WA3SPJ	My best year ever! Hope to get a better antenna up for next year's contest. 86 QSOs the first hour. Would like to see club scores, also.
N4BAA	Looks like the test is catching on. Lot of activity all night.
KD4IC	Extremely good contest!
NA4L	The DX was great.
W4TMR	Excellent contest. Looking forward to next year. Had a great time working all 50 states in one night!
KE5IV	Nothing like getting the 75-meter steerable array up a week after the contest—my normal good planning!
AA6EE	Better activity this year.
EA7ABW	There was no information about the contest in our Spanish magazine. (*Ed. note: We advertised the event in nearly 60 different international publications.*)
KC7PA	Lots of activity. Propagation great all night. Can't wait until next year.
WD8VEN	Hope to do better next year!
KS9O	Biggest thrill was working DL4TL at 1055Z. That's 11:55 am local time in West Germany. There was plenty of DX, especially in the South Pacific and JAs.
KI0F	A very fine contest again this year. Seems the quality of operators is getting better each year of this event. Still one of the better contests going!
4U1ITU	Great contest. Sounded like a madhouse over here with all the stations calling. Keep it up *73*, you have a winner!

28 of the August, 1979, issue of *73* for more details.)

ENTRIES:

Logs must show dates/times in GMT, stations worked, exchanges sent and received, bands and modes used, and scores claimed. Include a dupe sheet for entries with more than 200 QSOs. Each entry must include a signed statement that the decision of the Contest Committee will be accepted as final. No logs can be returned. Results of the QSO Party will be mailed to all entrants and an SASE is *not* required. Log sheets and summary sheets must be postmarked no later than October 17th and sent to: Boeing Employees' Amateur Radio Society, c/o Willis D. Propst K7RS, 18415 38th Avenue South, Seattle WA 98188.

KANSAS STATE QSO PARTY
0100 to 0700 GMT September 15
1300 GMT September 15 to 0700 GMT September 16
1300 GMT September 16 to 0100 GMT September 17

This is the third annual contest sponsored by the Boeing Employees' Amateur Radio Society of Wichita (BEARS0) and all amateurs are invited to participate. Use all bands and modes. Stations may be worked once on each band and each mode for contact points, more than once each band/mode if they are additional multipliers.

EXCHANGE:

QSO number; RS(T); and state, Canadian province, foreign country, or Kansas county.

FREQUENCIES:

Phone—1815, 3925, 7260, 14280, 21380, and 28580; CW—1805, 3560, 7060, 14060, 21060, and 28160; Novice—3725, 7125, 21150, and 28160.

SCORING:

Kansas stations score two points for each phone contact and three points for each CW contact, including contacts with other Kansas stations. Multiply contact points by the total number of different states, Canadian provinces, and other foreign countries worked. All others score two points for each phone contact and three points for each CW contact with a Kansas station. Multiply contact points by the total number of different Kansas counties worked (105 maximum). For all stations multipliers are counted only *once*

1984 RESULTS
75-METER WORLD SSB CHAMPIONSHIP

Indicated are callsign, QTH, QSOs, points, multipliers, and total score.
**World champion; *Certificate winners.

W/VE Single Operator

**N4BAA	—FL	—	894—4984—	116—	578,260
*N7DF	—KS	—	1076—5625—	95—	534,375
*N2NU	—NJ	—	722—4265—	98—	417,970
*KA1XN	—MA	—	682—3970—104—		412,880
*KØHA	—NB	—	725—3975—	88—	349,800
*ADØO	—CO	—	721—3955—	87—	344,085
*KØCS	—MO	—	608—3220—	88—	283,360
*KC8JH	—OH	—	600—3215—	85—	273,275
*KB3A	—PA	—	608—3115—	68—	211,820
*W4TMR	—NC	—	517—2750—	74—	203,500
KVØI	—NB	—	574—2950—	63—	185,850
*NA6T	—CA	—	339—2130—	87—	185,310
KQ3V	—PA	—	453—2370—	74—	175,380
*W5VUX	—GA	—	515—2630—	65—	170,950
*KI3V/Ø	—ND	—	492—2520—	64—	161,280
*WA1UJU	—WI	—	533—2700—	58—	156,600
*KV9S	—IL	—	428—2240—	66—	147,840
*KIØF	—MN	—	436—2205—	57—	125,685
*KA1YR	—CT	—	351—1865—	67—	124,955
KQ1Y	—FL	—	365—1920—	64—	122,880
*KC8P	—MI	—	332—1770—	69—	122,130
*N7KA	—AR	—	317—1685—	72—	121,320
KB9S	—WI	—	318—1715—	68—	116,620
*NA4D	—KY	—	375—1915—	60—	114,900
*KI7M	—OR	—	292—1685—	67—	112,895
*W3YOZ	—MD	—	381—1925—	52—	100,100
K4JPD	—GA	—	308—1575—	57—	89,775
*KA7BRE	—NV	—	277—1415—	60—	84,900
*K4ADI	—SC	—	314—1575—	50—	78,750
*KN1M	—ME	—	283—1450—	53—	76,850
KB3TR	—PA	—	301—1505—	48—	72,240
K7GWK	—OR	—	204—1160—	60—	69,600
KA7DLV	—MN	—	262—1315—	50—	65,750
K4JLD	—PA	—	163— 935—	64—	59,840
*W5TTE	—NM	—	229—1145—	51—	58,395
*KU2W	—NY	—	235—1180—	46—	54,280
*KB5FU	—TX	—	193—1075—	49—	52,675
N8ERV	—MI	—	261—1305—	40—	52,200
*WD8VEN	—WV	—	219—1095—	46—	50,370
KA1VT	—CT	—	173— 880—	51—	44,880
KBØU	—KS	—	141— 765—	57—	43,605
WA9BTY	—IL	—	160— 805—	53—	42,665
*W9XD	—IN	—	194— 975—	43—	41,925
*KC7PA	—UT	—	186— 940—	44—	41,360
*KB3PD	—DE	—	188— 845—	42—	39,790
NE6I	—CA	—	140— 720—	48—	34,360
W6OUL	—CA	—	123— 645—	53—	34,185
W3ARK	—PA	—	171— 865—	39—	33,735
W8VEN	—WV	—	142— 715—	45—	32,175
KQ1F	—MA	—	125— 660—	47—	31,020
WB8TEV	—OH	—	125— 635—	46—	29,210
*KB7M	—WY	—	114— 580—	44—	25,520
N6RQ	—CA	—	102— 535—	45—	24,075
KR9G	—IL	—	102— 525—	45—	23,625
*N5FRR	—LA	—	100— 520—	44—	22,880
K6YK	—CA	—	102— 515—	44—	22,660
WA6FGV	—CA	—	114— 580—	36—	20,880
W8UVZ	—MI	—	103— 520—	40—	20,800
NN4K	—GA	—	103— 515—	34—	17,510
WB3TKD	—NY	—	90— 450—	33—	14,850
WB9LSR	—WI	—	84— 420—	30—	12,600
N5AF	—TX	—	68— 345—	34—	11,730
N9KS	—WI	—	65— 325—	27—	8,775
WA8MJY	—MI	—	67— 335—	21—	7,035
N5AFV	—OK	—	54— 270—	25—	6,750
W4KMS	—VA	—	40— 205—	31—	6,355
KE5IV	—TX	—	44— 220—	24—	5,280
VE7AV	—BC	—	38— 190—	24—	4,560
W5EIJ	—AR	—	36— 180—	36—	3,420
WB4AFP	—SC	—	26— 130—	26—	2,210
VE8XO	—NWT	—	22— 115—	18—	2,070

DX Single Operator

**ZL1BQD	—New Zealand	—218—1835—		75—	137,625
*EA3CCN	—Spain	—143—1355—		53—	71,815
*KD7P/KH2	—Guam	—165—1220—		50—	48,800
*4U1ITU	—ITU/Geneva	—127— 875—		47—	41,125
EA7ABW	—Spain	— 60— 600—		25—	15,000
OK1KZ	—Czech.	— 58— 540—		58—	11,340
OK1TN	—Czech.	— 66— 380—		22—	8,360
I4CSP	—Italy	— 16— 100—		16—	1,600

Multi-Operator

**K1WW	—NH	—675—3885—		98—	380,730
*NA4L	—VA	—641—3695—		99—	385,805
*K9EC	—WI	—774—4110—		84—	345,240
*NW4B	—NC	—529—2950—		88—	259,600
*KS9O	—IL	—594—3170—		77—	244,090
*KM8U	—MI	—584—3025—		73—	220,852
KI4DC	—KY	—629—3175—		61—	193,675
*WA3SPJ	—PA	—505—2555—		59—	150,745
*WA6PVA/7	—OR	—393—2055—		66—	135,630
*N4FKF	—IN	—423—2115—		45—	95,175
*KK1B	—RI	—284—1450—		57—	82,650
*WB6RMN	—CA	—184— 955—		53—	50,615
*N4JII	—TN	—208—1040—		41—	42,640

Multi-Operator Participants

K1WW	—K1WW, KR1V
KK1B	—KK1B, WA1ZEB
WA3SPJ	—WA3SPJ + XYL
KI4DC	—KI4DC, K4IRX, NO4R
N4FKF	—N4FKF, KA9ORN
N4JII	—N4JII, NY4N
NA4L	—NA4L, N4VL, WV4N, NX4B, WD4BTF, WD4BTG, N4AKZ
NW4B	—NW4B, WA4YOM, K4NYV, AA4VK, WD4DII, N4SF, W4YZC
WA6PVA	—WA6PVA and ???
WB6RMN	—WB6RMN and ???
KM8U	—KM8U, N8AKY, KA8LDO
K9EC	—K9EC, AC9C, W9WI
KS9O	—KS9O, KC9XM

Check Logs: W6YMH/QRP, KL7XO, JH8TDZ, WD4MDW, and AA6EE.

regardless of how many bands or modes they are worked on. However, there will be an additional multiplier of one for each group of eight contacts with the same Kansas county for all non-Kansas stations.

AWARDS:

Certificates will be awarded to the highest-scoring station (both single and multi-operator) in each state, Canadian province, foreign country, and Kansas county. Additional certificates may be awarded at the discretion of the Contest Committee.

Worked Five Kansas BEARS Awards are also available to anyone working five club members before, during, or after the QSO Party. All QSO Party entries will be screened by the Contest Committee for possible Worked Five Kansas BEARS Awards. All Kansas BEARS Awards are administered by Mike Thornton WAØTAH, contest chairman.

ENTRIES:

Logs must show dates and times in GMT, stations worked, exchanges sent and received, bands and modes used, and scores claimed. Include a dupe sheet for entries with more than 200 QSOs. Each entry must include a signed statement that the decision of the Contest Committee will be accepted as final. No logs can be returned. Log and summary sheets are available for an SASE from the contest chairman. Entries must be postmarked no later than October 22nd and sent to: Boeing Employees' Amateur Radio Society of Wichita, c/o Mike Thornton WAØTAH, 1645 Lexington, Wichita KS 67218.

OHIO QSO PARTY
1400 GMT September 15 to 0500 GMT September 16
1300 to 1900 GMT September 16

Sponsored by the Cuyahoga Falls Amateur Radio Club, the contest is open to all radio amateurs worldwide. Each station may work a maximum of 12 hours during the contest period.

EXCHANGE:

RS(T) and state, VE province, DXCC country, or Ohio county.

SCORING:

Score 2 points for each contact with an Ohio station. Contacts with a Falls member will be worth 5 points and a contact with W8VPV, the club station, will count 25 points. Club members will identify themselves. Outside Ohio, multiply your total QSO points by the number of Ohio counties worked on all bands. Ohio stations will score 5 points for out-of-state contacts plus the member and club station bonuses. Multiply your QSO point total times the sum of states, VE provinces, and DXCC countries on each band. All stations running output power less than 5 Watts, multiply final score by 3; 5 to 200 Watts, multiply by 1.5, and over 200 Watts, by 1.

FREQUENCIES:

Phone—1890, 3900, 7230, 14230, 21360, and 28510; CW—1805, 3530, 7030, 14030, 21030, and 28010; Novice—3715, 7115, 21115, and 28115.

Club station W8VPV will be found on or near these frequencies.

AWARDS:

Plaques to the top station in Ohio and outside Ohio. Certificates to the top station in Ohio county, state, VE province, and DXCC country with two or more entries.

ENTRIES:

Mailing deadline is October 13th. Please include a summary sheet with number of contacts and multipliers, output power and signed declaration, plus total score along with log. Stations with 200 or more contacts should also include dupe sheets. Mail entries to: Anthony Luscre KA8NRC, N. Norman Dr., Stow OH 44224.

CAN-AM CONTEST
Phone
Starts: 1800 GMT September 15
Ends: 1800 GMT September 16
CW
Starts: 1800 GMT September 22
Ends: 1800 GMT September 23

Sponsored by the Ontario Contest Club and Canadian Radio Relay League, the contest is held to increase friendships among Canadian and American amateurs and to provide a means of measuring operating skills and equipment performance.

Categories of competition include (1) single operator, allband, single band, and QRP, but must be stations operated by the station licensee; (2) multi-operator, single-transmitter stations operated by more than one operator, or a single operator other than the licensee.

Multi-operator stations can operate the full 24-hour period. Single-operator stations can operate only a maximum of 20 hours with one or two rest periods totaling a minimum of four hours, which must be clearly marked in the log. Any further rest periods do not need to be logged.

Use all bands: 1.8, 3.5, 7, 14, 21, and 28 MHz with the US General portion of the bands recommended. For single-band entries, any band can be selected. All single-band entries will be judged in one category. It is up to the contestant to select the band that can bring him the highest score. For QRP entries, a maximum of 10 Watts input is allowed for use during the entire duration of the contest.

EXCHANGE:

RS(T) signal report, sequential QSO number starting with 001, plus multiplier area abbreviation—in that order. The multiplier abbreviation is the usual two-letter postal abbreviation for the 50 US states, CN for Caribbean (KC4, KG4, KP1, KP2, KS4, KV4, and their A-, N-, and W- prefix equivalents), PC for Pacific (rest of US possessions and Antarctica). Canadians will use NL—VO1 and VO2, NB—New Brunswick, NS—Nova Scotia, PE—Prince

RESULTS

WA2SPL, LC2CJ, EA3CCN, AND K9ZUH: 1984 WORLD 160-METER SSB CHAMPS

This was the year of champions on 160! New world records were set in various categories despite propagation to other parts of the world being at an all-time low. The QSO count has never been greater. Participation was at an all-time high, and the 160 World Championships continue to show steady growth year after year. In 1980 there were 569 participants, and those for the next four years, respectively, were 917, 1482, 1553, and this year, 1741.

For the single-operator class, Joe WA2SPL of New York State is the 160-Meter World Champion for 1984. With a tremendous score of 490,985 contest points, he managed 1098 QSOs, 59 states and provinces, and 24 DX countries. Joe's ability to land the far-off DX contacts made the biggest difference between his score and the well-known second-place finisher, Larry N7DF (now out of Kansas), who set a new world QSO record for the band. Apparently, Joe had a direct line to Europe, working several countries that mid-west and far-west stations couldn't. Super work, WA2SPL—typical of a true champion!

Oh, and speaking of world champions and world records, here's a glance at the QSO tally and how our contestants this year put in a big showing at the top of the list of 12 best.

N7DF	1984	1125
W9RE	1982	1118
WA2SPL	1984	1098
KC8P	1984	1048
VE3CDX	1984	1003
K0HA	1984	991
W0EJ	1984	986
W8LRL	1982	982
K0RF	1984	959
KC8JH	1984	950
WB3CGC	1982	932
KC8JH	1983	900

For the most part, everyone working 200 contacts or more managed to work all states or came within a state or two of accomplishing that. Not all Canadian provinces were represented, so it was a bit difficult to get a total sweep of the United States and Canada. WA2SPL led the pack with 59 states and provinces, followed by KC8P (58), W0EJ (58), VE1YX (58), K4JLD (58), KC8JH (57), K0HA (57), W3TS (57), N0DQS (57), N7DF (56), VE3CDX (56), K0RF (56), K7VIC (56), N8CKG (56), KX4X (56), W1RR (55), W2FCR (55), W4TMR (55), WA1UJU (55), K1LPS (55), KQ1F (55), KD4RI (54), AF1T (53), K6HHZ (53), K0STF (52), KA7AUH (52), K1KNQ (52), VE5RA (51), WA9TZE (51), KR9G (51), WA5NFC (50), K7IDX (50), KC9FC (50).

WA2SPL amazed us all working 24 DX countries during the contest. Most of us weren't even aware there was DX on the band! Joe was followed by W1RR and VE1YX with 17 countries apiece, KC8JH (13), K0RF (8), VE3CDX (7), K7VIC (6), and N7DF, KC8P, K0HA, W2FCR, KD4NI, KA1YR, K6HHZ, K1LPS, and KA7BRE with 5 DX countries each.

For single-operator DX stations, Jorge EA3CCN of Spain is this year's World DX Champion. Jorge found the conditions to be very poor, to say the least, but his persistence finally paid him dividends. His only outlet was to work other European stations on the band—he heard only one station from the USA. Only 21 QSOs separated the champion and the second-place finisher, SP5INA of Poland.

G3XTT of England led all DX stations, working a total of 36 DX countries while he was followed closely by SP5INA of Poland who recorded 31 countries and World Champion EA3CNN of Spain with 27 DX countries earned.

With extremely poor conditions to the North American continent, Irish station EI4DW managed to lead the multiplier list by working 4 US states and Canadian provinces, while EA3CCN totaled 3.

In the multi-operator class, Jay K9ZUH (assisted by WB9PXR) of Indiana is the new 160-Meter World Champ for the W/VE category. Jay's station had 633 QSOs, 52 states and provinces, and 2 DX countries, giving him a contest total of 171,450 points. There was a difference of only 65 QSOs between Jay and the second-place staff of Kansas contestant W0CEM.

Compared with the results of years past, this year's QSO count was considerably lower. Here is the listing of the top 10 as it currently stands:

K8ND	1983	1001	W4CN	1982	804
WB8JBM	1983	897	AK2E	1982	688
W4CN	1983	890	K9ZUH	1982	677
WA2SPL	1983	879	N7DF	1983	664
W8NGO	1982	877	K9ZUH	1984	633

For DX multi-operator stations, LZ2CJ stands out considerably with 384 contacts. As the new World Champion for this category, this score and QSO count set a new 5-year record. A tip of the hat to LZ2CJ and his SWL assistant, LZ2961—Thank you both for your support.

Many have written often asking what kinds of stations are being operated by the top contenders. This year we thought we would extract that data for you from the top 5 stations (some contestants did list their equipment) and let you see for yourself:

Single-Operator Class:

Call	*QTH*	*QSOs*	*St/Pr*	*DX*	*Antenna*
WA2SPL	NY	1098	59	24	Inverted vee, beverage
N7DF	KS	1125	56	5	
KC8JH	OH	950	57	13	Inverted vee
KC8P	MI	1048	58	5	Inverted vee
VE3CDX	ONT	1003	56	7	Full-wave loop, shunt-fed tower

Multi-Operator Class:

K9ZUH	IN	633	52	2	Alpha 1/4-wave vertical
W0CEM	KS	568	55	1	3-phased vertical
LZ2CJ	BU	384		37	Vertical, 4 beverages
WB9SLR	WI	519	53		
N0DKZ	CO	472	52	1	Inverted-L, KLM-160 vertical, longwire, and loop

As we said from the outset, the 5th annual event is now history. The 6th annual contest is just around the corner—scheduled for January 19-20, 1985. Obtain your contest rules and summary sheets today! Do not put it off another minute. Send an SASE to the contest chairman, Harry Arsenault K1PLR, 603 Powell Avenue, Erie PA 16505. Be sure to tell everyone on the band about this big event as it promises to be the biggest and the very best 160 contest going for single sideband. Psssst—tell the DX stations you work that a complete announcement package should appear in the November and December editions of nearly 60 foreign publications. See ya on the air with the new sloper.—*Bill Gosney KE7C.*

160-METER CONTEST SOAPBOX

AA1Q	I prefer CW to phone but this was more fun than I ever thought it would be. The best 160 contest, with lots of activity.
KW2J	To my surprise I found the contest where I expected to find CW and ended up with half the continental US in 6 hours!
WA2SPL	Biggest thrill was working OY8R. Lots of W/VE activity but it still seems DX stations didn't realize there was a contest. Contest was great however—lots of fun! (*Ed. note: we advertised in nearly 60 amateur-radio publications worldwide—most announcements appeared as early as the months of September and October! In the meantime, guess it will take some word-of-mouth info as well—can you help?*)
VE3CDX	This is my first time on 160—got on only 2 days ago.
KC7PA	Where was 1-land? Sure breaks up the winter boredom. I'll definitely be back next year.
KE7C	Lots of activity this year. Met some old friends and made many new ones. My personal thanks to all those who took time out to say hello. Your positive comments about the test are appreciated.
N8AXA/QRP	Anybody who worked me in the contest was doing pretty good. I ran 6 Watts output and had a ball.
N8CGK	There were more hams on 160 this year than I have ever heard before. Hope it stays the "gentlemen's band." Thanks for the contest; it was a blast!
N0DKZ	Best contest ever! Concerned about the DX window, however. Those who choose to observe the window properly are being penalized while those hard-to-get states are being worked between 1.825 and 1.830. By "gentlemen"? (*Ed. note: All we can do is make the window requirement part of our rules. We've done that already. Now let's enforce it. Should we require operators to circle all contacts in their logs which were made in the window? If there were more than 3 US/VE contacts made within the window it would be grounds for disqualification. Should a station fail to list the actual window frequency of a W/VE contact made there and it is found in a cross-checked log, would it be grounds for immediate disqualification? Do we really have to go to this extreme?*)
LZ2CJ	No conditions to the USA. Heard VE1YX and W1FC though!

Edward Island, SI—Sable and St. Paul Islands, PQ—VE2, ON—VE3, MB—VE4, SK—VE5, AT—VE6, BC—VE7, NW—VE8, and YU—Yukon.

SCORING:

American-to-American or Canadian-to-Canadian QSOs count 2 points each, American-to-Canadian (and vice versa) QSOs count 3 points each. The multipliers are the 50 US states, 2 US possessions (Caribbean, Pacific), 10 Canadian provinces, 2 Canadian territories (NWT, YU), and 1 Canadian Island (Sable, St. Paul). With 65 multipliers per band, the maximum possible multipliers on all 6 bands is 390.

The final score is the sum of the total QSO points from all bands multiplied by the sum of the multipliers from all bands. Phone and CW sections of the contest are considered separate contests. However, combined score for phone and CW will be used for overall competition. Combined score will be calculated by the contest committee as a result of the addition of phone and CW scores.

AWARDS:

Handsome first-place certificates will be awarded in each multiplier area on both modes in single-operator category. Top five multi-operator stations in each country will receive certificates for high combined phone and CW scores. Where appropriate, the contest committee will

1984 RESULTS
160-METER WORLD SSB CHAMPIONSHIP

Indicated are callsign, QTH, QSOs, states/provinces worked, DX worked, and total score. **World champion; *Certificate winners.

W/VE Single Operator

**WA2SPL	—NY	—1098—59—24—490,985	*N4ICS	—KY	— 283—35— 0— 49,525	KL7XO	—AK	— 23—10— 2— 1,740
*N7DF	—KS	—1125—56— 5—344,650	*KA1SR	—RI	— 204—43— 2— 46,350	WB0BHF	—IA	— 20—13— 0— 1,300
*KC8JH	—OH	— 950—57—13—337,050	*N5AFV	—OK	— 197—45— 0— 43,340	WB7THS	—OR	— 22— 8— 0— 880
*KC8P	—MI	—1048—58— 5—331,695	WG4U	—KY	— 189—43— 0— 40,635	AA6EE	—CA	— 10— 4— 0— 200
*VE3CDX	—ONT	—1003—56— 7—318,150	N9AKE	—IL	— 189—43— 0— 40,635			
*K0RF	—CO	— 959—56— 8—309,760	KR9G	—IL	— 144—51— 0— 36,720			
*K0HA	—NE	— 991—57— 5—309,070	W9VPJ	—IN	— 162—44— 0— 35,640			
*W1RR	—NH	— 801—55—17—302,400	K8GG	—MI	— 153—46— 0— 34,960			
*W0EJ	—IA	— 986—58— 2—296,700	*VE7ERY	—BC	— 141—43— 1— 31,460			
*K7VIC	—MT	— 740—56— 6—231,570	WB9IPH	—IL	— 142—44— 0— 31,240			
*W3TS	—PA	— 752—57— 4—231,190	N9BWC	—IL	— 141—40— 0— 28,600			
N8CKG	—OH	— 749—56— 4—225,900	W0EKS	—MN	— 124—46— 0— 28,520			
*W2FCR	—NJ	— 732—55— 5—222,300	W4TWW	—SC	— 145—39— 0— 28,275			
*W4TMR	—NC	— 827—55— 1—216,440	KG9O	—IL	— 119—41— 0— 24,395			
N0DQS	—IA	— 705—57— 3—216,600	W4TMN	—VA	— 108—45— 0— 24,300			
*VE1YX	—NS	— 496—58—17—198,000	AI9U	—IL	— 113—43— 0— 24,295			
*KX4X	—AL	— 649—56— 4—195,900	W9ZGP	—IL	— 127—38— 0— 24,130			
*KD4NI	—VA	— 646—54— 5—192,045	W8FGA	—MI	— 129—37— 0— 23,865			
*WA1UJU	—WI	— 644—55— 0—177,100	W3ARK	—PA	— 145—32— 0— 23,200			
*KA1YR	—CT	— 564—49— 5—154,980	*N7DU	—OR	— 121—35— 1— 22,320			
AF1T	—NH	— 500—53— 3—141,680	*VE1BPY	—PEI	— 124—33— 2— 22,050			
*VE5RA	—SASK	— 469—51— 4—130,075	VE3INQ	—ONT	— 100—43— 0— 21,500			
N4SF	—NC	— 516—49— 0—126,420	VE5XU	—SASK	— 97—44— 0— 21,340			
*K6HHZ	—CA	— 422—53— 5—124,700	NA8W	—OH	— 108—39— 0— 21,060			
*K1LPS	—VT	— 325—55— 5— 99,300	N4BSN	—TN	— 116—35— C— 20,300			
*K0STF	—SD	— 367—52— 1— 97,520	*VE1BRA	—NBRUN	— 130—29— 0— 18,850			
N4BNO	—NC	— 413—47— 0— 97,055	AA1O	—MA	— 109—32— 0— 17,440			
K4JLD	—PA	— 368—58— 0— 92,000	*VE2QO	—QUE	— 100—34— 0— 16,830			
*KQ1F	—MA	— 327—55— 0— 91,575	W1LOV	—RI	— 119—28— 0— 16,660			
WA9TZE	—WI	— 337—51— 2— 89,835	N8AXA/QRP	—OH	— 101—31— 0— 15,655			
*KA7BRE	—NV	— 319—49— 5— 87,480	VE3IHB	—ONT	— 89—34— 0— 15,130			
WB1GQR	—VT	— 356—45— 2— 84,130	*KC7PA	—UT	— 103—29— 0— 14,935			
*WA5NFC	—AR	— 321—50— 1— 82,110	K1NBN	—ME	— 86—31— 1— 13,920			
N4AGS	—VA	— 327—46— 1— 77,080	N8CSL	—OH	— 81—32— 0— 12,960			
*KA7AUH	—WA	— 284—52— 1— 76,055	W4KMS	—VA	— 80—32— 0— 12,800			
KB3MI	—PA	— 297—49— 1— 74,500	K5LZO	—TX	— 70—36— 0— 12,600			
*KA3DRO	—MD	— 303—49— 0— 74,235	W3CNS	—PA	— 82—27— 0— 11,205			
K7IDX	—WA	— 273—50— 2— 72,020	KV9S	—IL	— 68—26— 0— 8,840			
W3GG	—MD	— 306—47— 0— 71,910	W5IRP	—TX	— 56—30— 0— 8,400			
N0EKT	—IA	— 275—52— 0— 71,500	KB7M	—WY	— 57—29— 0— 8,265			
*N4FNB	—TN	— 305—45— 1— 70,380	K3OX	—PA	— 63—26— 0— 7,190			
K2DWI	—NY	— 321—42— 0— 67,410	KW2J	—NY	— 50—25— 0— 6,250			
*W8VEN	—WV	— 268—49— 1— 67,250	N4UH	—NC	— 50—24— 0— 6,000			
K1KNQ	—MA	— 238—52— 1— 66,250	VE6AHS	—ALT	— 49—22— 0— 5,390			
*KC9FC	—IN	— 245—50— 0— 61,250	W6PFE	—CA	— 51—18— 0— 4,680			
W3YOZ	—MD	— 286—46— 0— 61,180	N5DHF	—MS	— 39—23— 0— 4,485			
*W0HW	—MN	— 247—46— 0— 56,810	WB7CYO	—ID	— 51—18— 0— 4,140			
*WB9NUL	—IL	— 211—49— 1— 53,000	N9KS	—WI	— 35—20— 0— 3,500			
*K4ADI	—SC	— 236—43— 1— 50,380	KD9ET	—WI	— 31—17— 0— 2,635			
			AK7F	—WA	— 31—13— 0— 2,080			

DX Single Operator

**EA3CCN	—Spain	—136—3—27—40,350
*SP5INA	—Poland	—115—0—31—35,850
G3XTT	—England	— 71—0—36—25,560
OK1JDX	—Czech.	— 68—0—14— 9,520
EI4DW	—Ireland	— 48—4—14— 8,820
DJ3HJ	—W. Germany	— 36—0—11— 3,960

W/VE Multi-Operator

**K9ZUH	—IN	—633—52—2—171,450
*W0CEM	—KS	—568—55—1—159,320
*WB9SLR	—WI	—519—53—0—137,535
*N0DKZ	—CO	—472—52—1—125,345
*WA6PVA	—OR	—369—53—1—100,400
*W0SW	—MN	—328—51—0— 83,640
*NN5E	—TX	—297—51—3— 81,000
*WA1ZEB	—RI	—262—49—2— 67,320
*KA9KDZ	—IL	—195—46—0— 44,850
*KE7C	—WA	—162—48—2— 41,250
*N4ARO/6	—CA	—161—36—3— 31,980
WD0FEN	—KS	—129—42—0— 27,090

DX Multi-Operator

LZ2CJ	—Bulgaria	—384—0—37—142,080

Multi-Operator Participants

WA1ZEB —WA1ZEB, KK1B
LZ2CJ —LZ2CJ, LZ2N2961 (SWL)
N4ARO/6 —N4ARO, WB6RMN
NN5E —NN5E, KC5DX
WA6PVA —WA6PVA, WA7QXH
KE7C —KE7C, KA7GBC
KA9KDZ —KA9KDZ, KB8AC
WB9SLR —WB9SLR, AJ9E
K9ZUH —K9ZUH, WB9PXR
W0CEM —W0CEM, WA0CFZ, WA0TKJ, N0CPI, WB0TOC, WB0WHB
N0DKZ —N0DKZ, N0BSA, N0EOY
WD0FEN —WD0FEN, WD0CXN, KA0PXB
W0SW —WA0NOX, WD0GUK, AI0E, WD0DTU, N0ETF, KN0J

Check log: SP6CC.

award additional awards. All scores will be published in *QST* magazine. Trophies will be awarded the combined single- and multi-operator champions in Canada and the USA.

ENTRIES:

Logs must show all times in GMT. Indicate multipliers the first time only on each band. Log must be checked for duplicate contacts, correct QSO points, and multipliers. Do not use separate logs for each band. Rest periods must be clearly marked in the log. Each entry consists of: log sheets, summary sheet showing all scoring information, category of competition, operator's name and callsign, address of the station, and signed declaration. Entries with over 200 QSOs must include check sheets for each band.

Official logs, check sheets, and summary sheets with multiplier tables are available from the contest chairman; a large SASE with Canadian stamps (or US stamps not glued to the envelope) will bring the samples. Contestants are encouraged to use them; they greatly help with the processing of the entries.

Violation of national amateur-radio regulations or rules of the contest, unsportsmanlike conduct, poor signal quality, taking credit for excessive duplicate contacts, or unverifiable QSOs or multipliers will be deemed sufficient cause for disqualification. Incorrectly logged calls will be counted as unverifiable contacts. Actions and decisions of the CAN-AM Contest Committee are official and final. All entries must be postmarked not later than 30 days after the contest and mailed to: CAN-AM Contest, Box 65, Don Mills, Ontario M3C 2R6, Canada.

MAINE QSO PARTY
Starts: 2300 GMT September 21
Ends: 2359 GMT September 23

Sponsored by the Portland Amateur Radio Association, the contest is open to all. Stations may be worked on phone, CW, and RTTY for each band.

EXCHANGE:

RS(T), serial number, and state, province, country, or Maine county.

FREQUENCIES:

SSB—1870, 3930, 7280, 14280, 21380, and 28580; CW—1810 and 60 kHz up from low end of band; RTTY—3610 and 90 kHz up from low end of band; Novice—3720, 7120, 21120, and 28120.

SCORING:

Complete QSOs count 3 points on CW, 5 on RTTY, and 1 on phone. Out-of-state stations multiply the total number of QSO points by the number of Maine counties contacted (maximum of 16). Maine stations multiply the total number of QSO points by the sum of Maine counties, states, provinces, and countries.

AWARDS:

Certificates will be awarded to top scorers. In addition, this year a trophy will be given to the highest aggregate Maine club score.

ENTRIES:

Mail entries by December 1st to PARA, Box 1605, Portland ME 04104. Applications for the Worked All Maine Counties award may go to the same address.

G-QRP-CLUB CW ACTIVITY WEEKEND
Starts: 0900 GMT September 22
Ends: 2300 GMT September 23

All radio amateurs interested in QRP are invited to take part in the club's activity weekend. No special exchange information was mentioned in the information provided by the club. The operating schedule for this last weekend is as follows:

- 3560 kHz—0900-1000, 1700-1800, and 2200-2300 GMT.
- 7030 kHz—1200-1300, 1500-1600, and 1900-2000 GMT.
- 14060 kHz—1000-1100, 1400-1500, and 2100-2200 GMT.
- 21060/28060—1100-1200, 1600-1700, and 2000-2100 GMT.

Reports on the Activity Weekend are welcomed by Christopher J. Page G4BUE, Alamosa, The Paddocks, Upper Beeding, Steyning, West Sussex BN4 3JW, England.

Full details on membership of G-QRP-Club available from the membership secretary, Fred Garratt G4HOM, 47 Tilshead Close, Druids Heath, Birmingham B14 5LT, England.

W2NSD/1
NEVER SAY DIE
editorial by Wayne Green

from page 6

might want to add ten more bits for 1,000 shades of color, too—why be limited to black-and-white pictures?

A full-page picture 10" high might have 130 lines per inch—1300 lines. Each 8" line would be made up of 130 × 8 = 1040 dots. Each dot would require four bits for dot size and ten for color—14 bits. Then we need some housekeeping bits to tell our computers when the information for a dot has started and when it has stopped—16 bits. Shall we add that all up?

1300 × 1040 = 1,352,000 dots for a full-page illustration. Sixteen bits per dot gives us 21,632,000 bits per page. If we send these at 9,600 baud (bits per second), which is very fast these days, we're talking about 2,253 seconds to send that one page—37 minutes. And we gripe at eight seconds for a slow-scan picture!

How would you like to get a magazine over the telephone that way? And 9,600 baud is the very, very top limit of that delivery system. Even a small magazine might take 82 hours. With a dedicated telephone line, you could only get two magazines a week, and think of the line cost!

So we need something with a bit more bandwidth than a telephone wire, which is about the same as a ham voice channel. We need about one thousand times the bandwidth—3 MHz—to get a magazine through in a few minutes. We can do that with microwaves, satellites, cable, or laser and fiber optics. The cable is already in place, so perhaps something can be done to send a magazine via cable. No one has invented a simple system for delivering a magazine by cable or microwave, so that would have to be developed. Someone will probably do that and make a bundle.

A good place to develop something like this is on the UHF ham bands—where 3 MHz isn't a big deal. But we're not bothering to use those bands these days, so they could be blown away soon—just as our 220-MHz band is being blown away because we refused to let the FCC test the no-code-license idea there.

Those microwave channels are desperately needed by the communications industry, and our enormous allocations are sitting there empty, with no real hope of any serious use. Of course, once they're gone, they're gone forever. 160m used to go from 1750 to 2050 kHz; now how much of it do we really have?

Hey, if you'll get hot on 3300 MHz and write some articles, I'll be delighted to print 'em and that, in turn, will get more hams interested in the band. A bit of activity on our now almost unused microwave bands could help save them—if you're game. Are you interested in saving this valuable ham resource?

When you consider the amount of spectrum that is going to be needed for communications in a few years, it's almost too much to grasp. Video conferencing is going to happen, which means that hundreds of thousands of people will be needing several megahertz each for extended periods. That's got to go via laser and fiber optics, for we don't even have enough satellite channels in prospect to handle that kind of volume.

The millions upon millions of computers around the world are going to have to be able to communicate with each other in seconds. This is going to take an elaborate network of repeaters and switching. In the early days, we may be able to make do with satellites, but eventually the volume is going to push the service into a combination of short-range microwaves and fiber optics for the longer hauls.

In the meanwhile, we sit at our ham rigs, trusty key in hand, keeping alive the memory of good old Sam Morse—whose invention was rendered obsolete in 1876 when Bell used his new intercom system to call Watson. I think it is kind of nice to have this living memorial to a quaint old technology—a hundred years old. We're keeping alive some Americana.

In line with that thought, is it really honest to use those new-fangled speed keys? I won't even bother to comment on cretins who use electronic keys or those damned typewriter abominations. The old straight key lets the operator's personality come through, right? J-38 forever!

Old timers will remember when hams had a wide range of microwave channels which could be used via satellites. We lost them at the ITU. The League represented us at the conference and you'll find the sorry report in the fine print in *QST*. As Daniels, who was president at the time, said, we didn't do our homework. We lost about 99.99% of our satellite allocations at that time and 100% of our opportunity to ever keep up with technology.

This aggravates me a bit. We're looking at probably a 5% loss of hams this year instead of growth, and our drop in the entry of youngsters is on the order of 80%. The *73* readers who teach school tell me that the kids today are too smart to fall for the Morse-code ploy. Lots of them would like to try ham radio, but their intelligence is offended by the code requirement.

Fortunately for us, the Japanese got rid of the code about twenty years ago, so we'll have the hundreds of thousands of very-well-paid Japanese engineers and technicians it will take to provide our coming communications needs. Their young hams are hard at it, inventing new circuits; you should see their ham magazines—five to six times as thick as anything we have and packed with construction articles every month.

Hey, if you'd like to see for yourself, join me in October (there's just time to get your visas) for a trip to Japan and see their incredible Consumer Electronics Show. The trip, which includes stops at the electronics shows in Taipei, Hong Kong, and Korea, costs about $2,500 and is first class. Drop me a line. I try to get to these shows as well as the two American shows every year so I know what's happening worldwide.

The American shows are

$$ HOME-BREW III $$

Turn your hot solder into cold cash! Once again, *73* is searching for the greatest home-brewer in the land. All projects have a chance to appear in *73*, and the best of the best will be showered with fame and fortune.

Top prize is $250. Second place is worth $100, and three runners-up will each earn $50. Of course, this is in addition to the payment every author receives for publishing in *73*.

Contest Rules

1. Entries must be received by November 1, 1984.
2. To enter, write an article describing your best home-brew construction project and submit it to *73*. If you haven't written for *73* before, please send an SASE for a copy of our author's guide.
3. Here's the catch: The total cost of your project must be $73 or less, even if all parts were bought new. Be sure to include a detailed parts list with prices and sources.
4. Our technical staff will evaluate each project on the basis of originality, usefulness, reproducibility, economy of design, and clarity of presentation. The decision of the judges is final.
5. All projects must be original, that is, not previously published elsewhere. There is no limit to the number of projects you may enter.
6. All rights to articles purchased for publication become the property of *73*.
7. Mail your entries to:

73 Magazine
Editorial Offices
80 Pine Street
Peterborough NH 03458
Attn: Home-Brew III

largely Japanese these days, the same firms, in all probability, which will be taking over our communications: Hitachi, Matsushita, Mitsubishi, Toshiba, Sony, NEC.

Of course, if there were some way to get American teenagers interested in amateur radio rather than popping, snorting, smoking, and sniffing drugs, drinking, watching TV, and other total wastes of time and money, we might stand a chance. The kids are not going to go for the Morse code—forget that—so do you have any other ideas? I'm stymied.

Kids are not career-oriented enough to spend time doing something or learning something for that reason. They'll work hard at learning if they perceive it as fun and there is an immediate goal which makes sense to them—a goal such as a hobby. None of us who started amateur radio in our teens had any idea of a career; we did it because it was fun and then later found that our hobby just naturally was one hell of a great career bonus. Tomorrow doesn't exist for most kids; why else would so many millions drop out of school? Thus any appeal we may want to make to kids has to be as much on an immediate-reward basis as possible.

You know, if it took two days for pot to work, kids wouldn't bother with it. This immediate-gratification syndrome really has to be reckoned with. We have to understand that kids today just are not brought up to be rewarded next week for work today, so they haven't any patience with taking weeks to learn the code so they can get on the air in an eon or two.

This is a natural response for kids, so we shouldn't be surprised. I suspect that a couple of generations ago, when the radio was blaring fourteen hours a day in homes instead of the TV, perhaps we taught kids the benefits of patience. Now, with the parental eyes and attention on "Dallas" and "Falcon Crest," most kids are brought up with little more than their natural inclinations to guide them, no matter how destructive.

If you had no fear of addiction, mightn't you try cocaine and heroin? Well, when tomorrow isn't real, addiction isn't real, so what's the worry?

Perhaps, as the editor of a ham magazine, I hear a lot more than you do from people who have tried (some for years) to learn the code. Some have dyslexia, some have trouble getting the two sides of their brain to cooperate—and the learning of the code is an incredibly complex use of the brain. Some people can learn the code in a few minutes—it took me less than a half hour to learn the characters and just a few hours of practice to get to 13 per. Things like that are easy for me. Yet I've known several people who wanted ham licenses so bad they would almost have killed for them and yet they never were able to manage the code.

Despite the irrelevancy of amateur radio today, we've managed to hold our low bands pretty well. I'd chalk that up more to bureaucratic bungling and the virtual death of the American consumer electronics industry, which is the group that normally would be fighting for our frequencies. If they were alive, they'd be grabbing for our bands in a minute and we'd have little argument to stop them—and less power. There are less active amateurs today than owners of Timex computers.

So, as I turn on my rig to see if Eva has her list all set for another DXpedition, I know that it's likely that I'll be able to ham for a few more years. Who knows, perhaps satellites and fiber optics will save our low bands and even take the pressure off some microwave bands. But the growing number of mobile services are going to take all of the old television channels and more as TV is moved to fiber-optic cable or direct-broadcasting satellites.

People walking or driving around are going to want to communicate. We know that from the ham use of repeaters. It's rare these days to see a ham without at least one HT on his belt and at Dayton some have a half dozen dangling. Many groups bring their own repeaters to Dayton—heaven forbid they should lose contact with members of the club somewhere out in the flea market.

We see the beginnings of this with cellular radio. If I can talk with someone a hundred miles away while skiing down a mountain in Colorado or New Hampshire (and I've been doing that for 15 years now), you can bet that the businessman is going to make sure that he can do at least that. It'll take a while to organize—it will require a lot of channels and it will sell an incredible amount of Japanese equipment.

Yes, I see this coming and it is frustrating. The League won out on the Morse code, so now I don't know of any way to get ham clubs started in high schools. They have them in every high school in Japan, as you already know. And, yes, I know that a good many hams won't agree with me, but I'll bet none of 'em will be specific about where they disagree.

On the code? We have as clear proof as anyone could ask for in the Japanese example of what happens when you eliminate the code test. They have licensed about one and a quarter million hams so far. Oh, yes, the Japanese are different. Yep, I've heard that. Well, it's true, apparently. IQ tests seem to indicate that they have an intelligence lead on us of about ten points on the average, according to the scientific reports. They sure seem to have done the smart thing in eliminating the code from the ham exams.

I'm writing this editorial on a Radio Shack computer, designed and made in Japan. I print it out on a C. Itoh printer, designed and made in Japan. I am wearing a Seiko UC-2000 computer watch, designed and made in Japan. MY CD player in the corner is by Sony, designed and made in Japan. My hi-fi and TV sets are by Hitachi, designed and made in Japan. My ham rig is a Kenwood, and you know who designs and makes all our ham gear as well as I do. None of these is a copy of an American invention; they are all creative developments and most of them were done by Japanese who started out as hams in high school a few years ago while we were killing ourselves off with the Morse code.

Anyone out there game to petition the FCC to reconsider their mistake with the no-code proposition?

NEW TECHNOLOGY

Let me see some hands: How many of you know about Compact Discs—CDs? These were probably the biggest hit of the recent Summer Consumer Electronics Show in Chicago. These are the first digital audio recording medium and once you hear a CD, you will be all through buying LP records. The difference is that great. I've been enough impressed with the difference to

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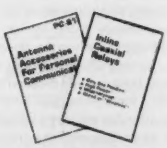

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get a magazine started to support this new industry—*Digital Audio*.

But the CD has even more prospects than as a whole new start for hi-fi. We'll be seeing these discs used for data storage for computers and even as low-cost interactive video players. The material is stored digitally on the disc and then read with a laser beam, so there's no wear on the record no matter how many times it is played.

Interactive video is the best delivery system we've yet found for reducing the cost and improving the quality of education. I attended a symposium on the subject recently at Dartmouth and enthusiasm is high in the educational community for the interactive video disc potential. Maybe I should start a magazine, eh? Not yet.

If you're an entrepreneur and want to know what technology is going to explode next, I'll tell you. There are opportunities for hundreds of small firms to get started with products in this new field and make millions. This is the briefcase, lap, or kneetop computer. Businessmen all have to do homework. It won't take long before they discover that these small computers will help them enormously to write, do business plans, schedule, work on spread sheets, communicate, and so on. I predict that within two years there will be more of these small computers sold than desktops.

These computers need software, accessories, small printers, and information just like the desktop computers did. In a couple of years, most of the businessmen you know will have one or even two. I already carry around two most of the time—they do slightly different things. I use 'em in the car, on planes, and when I have a few minutes to wait for someone. Most of you have been ignoring my exhortations for you to get into business and make money for years, so I'm used to it. But I do get a lot of pleasure when someone says hello at a hamfest or other show and claims my editorials got them off dead center and helped make them rich. I can put up with an awful lot of old hams (poor hams, I should add) grumbling about not agreeing with me when I hear that now and then.

WAYNE GREEN ALUMNI REUNION

If you know anyone who has worked for me over the last 24 years, have them get in touch. I'm organizing a special dinner meeting at the November Comdex in Las Vegas so we can get together for a reunion. Hey, next year is the 25th anniversary for *73*. Not many magazines survive that long.

FUN!

John Edwards KI2U
PO Box 73
Middle Village NY 11379

This month's column is about nothing in particular—just some random quizzes on random topics.

ON THE ROAD AGAIN

Now that the FUN! poll tabulations are completed, we can get back to the business at hand. Now, where was I? Oh, yeah. EPCOT Center. I visited Walt's final brainstorm last April while in Florida to cover a space-shuttle launch for another magazine.

You would think that Mr. FUN! would have fun at a place like EPCOT, right? Well, I did—in a way. I couldn't stop laughing at all of the stupid exhibits. Experimental Prototype Community of Tomorrow? Only if Kodak, GM, and AT&T decide to rework our neighborhoods. Frankly, the place is nothing but a big trade show glopped with the usual Disney hokum. The food at the various restaurants was good, but the rest of my visit was a waste.

Now, don't get me wrong. I'm not against big business. I like money as much as anyone (perhaps more so), but I just can't see how EPCOT is going to help us change the world. It may show us the glories of a few multinational corporations, but it'll take a lot more than a 3-D movie and some talking dummies to lead us into the third wave. Anyway, how can you take the place seriously when its communications exhibit includes a revolving cover of *CQ Magazine*? Really! Take my word; stay away.

My spring travels also took me to Washington DC and the Smithsonian's revamped Museum of American History. Make a note to hit this place the next time you visit Disney World by the Potomac. The displays of early radio, telegraph, and computer equipment are superb and bound to thrill any red-blooded ham. Sadly, NN3SI, the Smithsonian's ham station, was unattended the day I visited. Quite a pity. It was a Saturday and the place was loaded with spring tourists. C'mon guys, let's get our act together. If I had had my ticket with me, I would have sought someone out for permission to operate.

ELEMENT 1 MULTIPLE CHOICE

1) By now we all should know that Hiram Percy Maxim W1AW was a founder of the American Radio Relay League, back in 1914. But who was the League's co-founder?
   1) Herbert Hoover
   2) Clarence Tuska
   3) Franklin Gothic
   4) Urban Hewitt
2) What were the official Conelrad frequencies?
   1) 14.090 and 21.090 MHz
   2) 540 and 880 kHz
   3) 640 and 1240 kHz
   4) 710 and 1600 kHz
3) The word "Conelrad" stands for:
   1) Consolidated emergency limited radio system
   2) Connected electronic radios
   3) Control of electromagnetic radiation
   4) Consolidated electronic radiation network
4) You'll find the "Graveyard" on:
   1) 20 meters
   2) 11 meters
   3) 160 meters
   4) the AM broadcast band
5) Radio Peace and Progress broadcasts from:
   1) The United States
   2) China
   3) The Soviet Union
   4) Taiwan

ELEMENT 2 SCRAMBLED WORDS

Unscramble these terms related to shortwave listening:

tactis	arlye	goirnef
breactila	saeservo	renegein
granpopada	tenrenvomg	gaugelan
tralveni	losegiuri	micus
telnis	gorparm	domsecti
dbna	licensetand	plisrotac
drabsocat	luitities	

ELEMENT 3 TRUE-FALSE

	True	False
1) Howard Hughes was a ham.	_____	_____
2) Andy Devine was a ham.	_____	_____
3) Harry Truman was a ham.	_____	_____
4) The first Dayton Hamvention was held in Columbus.	_____	_____
5) The FCC allows W1AW to use up to 10,000 Watts of power during code-practice sessions.	_____	_____
6) The planet Jupiter can be heard on 21 MHz.	_____	_____
7) SINPO is a system used to determine a received signal's quality.	_____	_____
8) The Voice of America is operated by a private company.	_____	_____
9) The electrical term "siemens" used to be known as "mho."	_____	_____
10) A triode has two elements.	_____	_____

ELEMENT 4 ALPHABET GAME

Complete the words below by placing letters of the alphabet on each dash. Use each letter only once.

A B C D E F G H I J K L M
N O P Q R S T U V W X Y Z

1) __OULE
2) __O__
3) __IP__LE
4) SC__E__AT__C
5) __I__O__AT__
6) PERM__A__ILIT__
7) __U__ERRE__ENER__TIVE
8) __RE___EN__Y
9) __E__E__

THE ANSWERS

Element 1:
1—2 But HPM got all the publicity.
2—2 So it says on the radio in my '62 Chevy Impala convertible. Nice car. Dated radio.
3—3 In theory, it was supposed to keep enemy aircraft from zeroing in on a town or city.
4—4 At the upper end of the band, where the FCC lumps low-powered broadcasters.
5—3 Yeah, right.

Element 2:
(Reading from left to right): static, relay, foreign; calibrate, overseas, engineer; propaganda, government, language; interval, religious, music; listen, program, domestic; band, clandestine, tropicals; broadcast, utilities.

Element 3:

1—True	6—True
2—True	7—True
3—False	8—False
4—False	9—True
5—False	10—False

Element 4:
1—JOULE
2—VOX
3—DIPOLE
4—SCHEMATIC
5—KILOWATT
6—PERMEABILITY
7—SUPERREGENERATIVE
8—FREQUENCY
9—ZENER

SCORING

Element 1:
Five points for each correct answer.

Element 2:
One point for each unscrambled word.

Element 3:
Two and one-half points for each correct answer.

Element 4:
Two and one-half points for each word completed.

How did you do?
1-20 points—Amazing. You can read!
21-40 points—Not good
41-60 points—Not bad
61-80 points—Pretty good
81-100 points—Want to take over the column?

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BEAMWIDTH:	48°	WINDLOAD:	1.25 sq. ft.
FEED IMP:	50 ohm unbal.	WT. (LBS):	7.5
BALUN:	4:1,2KW	ELLIPTICITY:	±3 dB Max.
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BOOM LENGTH:	7.3 ft.	VSWR:	1.5:1
BEAMWIDTH:	44°	FEED IMP:	50 ohm unbal.
WT. (LBS):	4.5	BALUN:	2–4:1. 1KW
MAST DIA:	Cen–Rear/1½"	ELLIPTICITY:	3dB MAX.
CIRCULARITY SWITCHER			(CS-2) OPTIONAL

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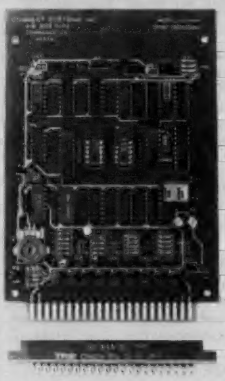

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✓ See List of Advertisers on page 98

SATELLITES

SPACE-SHUTTLE COMMENTARY

The Spaceport Amateur Repeater Club (SPARC) has been authorized by AMSAT to transmit space-shuttle-mission commentary for all missions on Special Services Channel H2 (145.963 MHz) of AMSAT-OSCAR 10. SPARC, through the facilities of K4GCC and WB4ZXS, will provide space-shuttle-mission audio for several hours each as time permits. All amateur-radio operators are invited to submit reception reports to: SPARC, PO Box 672, Merritt Island FL 32952. (de Carl AA4MI)

HAM IN SPACE—TAKE 3

Yet another amateur has been chosen by NASA for the space-shuttle program. This time it's Dr. Ron Parise WA4SIR. Ron's contract calls for at least two missions, the first being 61F scheduled to fly in March, 1986. Ron is very active in AMSAT and has been science coordinator for the UO-9 project. Regarding amateur-radio operation from the shuttle, Ron says he is "enthusiastic" and looks forward to bringing some radios aboard. Possible follow-up flights may include missions in November, 1986, and July, 1987.

SPACE TRAFFIC CONTROL

AMSAT may soon need to sponsor a permanent ham in space just to direct traffic. Plans for the next year or so call for several new satellites including Phase IIIC, ARSENNE, JAS-1, PACSAT, and hopefully a parasitic geosynchronous system. Add these to the birds already orbiting (OSCARs 9, 10, 11, and six RS-series) and we've made quite a contribution to the already-present congestion. Any volunteers?

TIMELY INFORMATION

Up-to-date information on all aspects of satellite operation may be obtained by tuning in to one of AMSAT's information nets. Times are in UTC and frequencies are in kHz:

0200 Tuesday on 3850
1900 Sunday on 14282
1800 Sunday on 21280
0300 Wednesday on 3850
0400 Wednesday on 3850

You may also receive late-breaking news by copying the ARRL bulletin. For a complete schedule of ARRL transmissions, send an SASE to the League at 225 Main Street, Newington CT 06111.

Thanks to *Amateur Satellite Report* for this month's information.

RS-5		RS-6		RS-7		RS-8		
UTC	EQX	UTC	EQX	UTC	EQX	UTC	EQX	Date
0009	244	0000	248	0025	249	0146	263	1
0003	244	0143	275	0015	248	0143	264	2
0158	275	0128	273	0005	247	0140	265	3
0152	275	0112	271	0155	276	0138	265	4
0147	275	0057	268	0145	275	0135	266	5
0142	275	0042	266	0135	274	0132	267	6
0136	275	0026	264	0126	273	0129	268	7
0131	276	0011	262	0116	272	0126	269	8
0125	276	0154	289	0106	272	0123	269	9
0120	276	0139	287	0057	271	0121	270	10
0115	276	0123	284	0047	270	0118	271	11
0109	276	0108	282	0038	269	0115	272	12
0104	277	0053	280	0028	268	0112	273	13
0059	277	0037	277	0018	267	0109	274	14
0053	277	0022	275	0009	266	0106	274	15
0048	277	0006	273	0158	295	0104	275	16
0043	277	0150	300	0148	294	0101	276	17
0037	277	0134	298	0139	293	0058	277	18
0032	278	0119	295	0129	293	0055	278	19
0027	278	0103	293	0119	292	0052	278	20
0021	278	0048	291	0110	291	0049	279	21
0016	278	0033	288	0100	290	0047	280	22
0011	278	0017	286	0050	289	0044	281	23
0005	279	0002	284	0041	288	0041	282	24
0000	279	0145	311	0031	287	0038	283	25
0154	309	0130	309	0022	286	0035	283	26
0149	309	0114	307	0012	285	0032	284	27
0144	309	0059	304	0002	285	0030	285	28
0138	310	0043	302	0152	314	0027	286	29
0133	310	0028	300	0142	313	0024	287	30
0128	310	0013	297	0132	312	0021	287	1
0122	310	0156	325	0123	311	0018	288	2
0117	310	0140	322	0113	310	0015	289	3
0111	311	0125	320	0103	309	0013	290	4
0106	311	0110	318	0054	308	0010	291	5
0101	311	0054	315	0044	307	0007	292	6

AWARDS

SUBMARINERS

The DuPage Amateur Radio Club will be operating a special-event station, W9DUP, in honor of the 30th annual convention of the US Submarine Veterans of World War Two from Wednesday, August 29, through Saturday, September 1, 1984, from the submarine *USS Silversides* which is docked as a War Museum alongside Navy Pier in Chicago.

Hours of operation will be from 1100 to 0300 UTC daily on 10 through 80 meters and also two meters. For a commemorative certificate send $1.00 and a #10 SASE to DARC, PO Box 71, Clarendon Hills IL 60515.

WINO AT WORLD'S FAIR

The Wireless Institute of New Orleans (WINO) will be operating a special-event station at the Louisiana World Exposition on August 31 and September 1. The "Wonderful WINO Weekend at the World's Fair" will enable hams around the world to contact the World's Fair amateur radio station, K5WF, on the Friday and Saturday nights preceding Labor Day, from 10:00 pm CDT until 2:00 am CDT.

Contacts will be on the forty-meter band, LSB, on or near 7.240 MHz. Propagation permitting, K5WF will also be on 75 and 20 meters.

Special commemorative QSL/Certificates confirming contacts will be available for an SASE to: WINO, Box 6541, New Orleans LA 70174.

LAKE COUNTY ARS

The Lake County Amateur Radio Society will have a special-event station, N6GJM, at the Lake County Fairgrounds on August 31 through September 3, 10:00 am to 10:00 pm PDST.

Operating frequencies will be 10 to 20 kHz above the bottom portion of CW and phone bands, 15 through 80 meters.

A special certificate is available for an SASE to KR6G, PO Box 682, Cobb CA 95426.

OK CORRAL, TOMBSTONE, COCHISE COUNTY, ARIZONA

A special-event station will again operate from the heart of the OK Corral, in conjunction with the third annual Rendezvous of The Gunfighters, September 1, 2, and 3, 1984.

The OK Corral was the site of the famous shoot-out between the Earp and Clanton factions in 1881. Operations, cosponsored by KB7KZ and the Old Pueblo Radio Club will begin at 1500 UTC, September 1, and run through 2200 UTC, September 3, on CW and SSB. Frequencies: SSB—28680, 21380, 14280, 7280; CW—21130, 7130.

A certificate will be awarded to all who work us as well as SWLs. Please send a large 8-1/2" × 11" SASE (40 cents postage) to: KB7KZ, PO Box 36032, Tucson AZ 85740.

LOCOMOTIVE MOBILE

The Northern New Mexico Amateur Radio Club will hold its 2nd annual steam-locomotive mobile operation on the Cumbres and Toltec Railroad, September 8, 1984, de 1000 MST to 1630 MST. Frequencies of operation will be 14.225 MHz and 7.225 MHz. The train will travel from Antonito CO to Osier CO and back, crossing the NM and CO border 10 times. If you wish to join us, contact Daryl Grant W7LHO, 1865 Camino Lumbre, Santa Fe NM 87502.

HONORING BEAR BRYANT

The West Alabama Amateur Radio Society (WAARS) will operate the 2nd annual special-event station on Saturday, September 8, in commemoration of the greatest college football coach in history, Paul "Bear" Bryant.

The Bear Bryant special-event station will operate from the campus of the University of Alabama. WAARS will operate using the callsign KE4TN from 1300Z to 2400Z on that date.

Phone frequencies will be the bottom 25 kHz on the General 40-10-meter phone band. The club will also work Novices on the bottom 25 kHz of the Novice band. The club will offer a handsome commemorative certificate of the event to any station worked. Send $1 and a large SASE to the West Alabama ARS, PO Box 1741, Tuscaloosa AL 35403.

MARK TWAIN ARA

The Mark Twain ARA will operate W0KEM from 1400Z to 2300Z on September 8th and 9th to celebrate the dedication of the 20,000-acre Mark Twain Lake and Clarence Cannon Dam in east-central Missouri.

Phone operation will be in the lower 25 kHz of the 40-, 20-, and 15-meter General bands, also Novice operation in the 40-meter band. For certificate send a legal-size SASE to Mark Twain ARA, PO Box 56, Center MO 63436-0056.

OCEAN MONMOUTH ARC

Ocean Monmouth Amateur Radio Club (OMARC) will operate KC2Q from 1600Z on September 22, 1984, until 1600Z September 23, 1984, from the Guglielmo Marconi Memorial Tower which was used during early transoceanic receiving experiments. Frequencies: 3.965, 7.265, 14.265, 21.365, 28.565. For a QSL send an SASE, or for a certificate and a QSL send $1.00 to KN2B, 18 Gardners Lane, Manasquan NJ 08736.

PAUL BUNYAN FESTIVAL

The Paul Bunyan Wireless Association and the Brainerd Area Amateur Radio Club will be sponsoring a special-event station from the site of the Paul Bunyan Festival near Brainerd MN. Operation will be from 1800Z on September 22, until 2100Z on September 23. Operation will be in the lower portions of the General-class phone bands of 40-10 meters. For a commemorative QSL, send QSL and SASE to Rick Paine KC0YG, PO Box 354, Pequot Lakes MN 56472.

MOUNTAIN STATE AWARD

The Logan County ARC will hold its fourth annual Mountain State Award expedition from 1600 UTC on September 22, until 0200 UTC September 23, 1984. The callsign will be W8VEN.

Phone operating frequencies will be approximately 25 kHz from the low end of the General phone 80- and 40-meter bands as propagation allows.

A handsome 8" × 10" certificate will be awarded to all contacts submitting a QSL and legal-size SASE to Robert T. Johnson W8VEN, PO Box 320, Stollings WV 25646.

DR. DIGITAL

Robert Swirsky AF2M
PO Box 122
Cedarhurst NY 11516

MAILBAG

Every so often, I look through the letters I receive. It always amazes me to see all the silly things I am asked to do—debug programs, design hardware, or write software. Today, I got what is by far the most interesting letter. It reads:

Dear Dr. Digital,

I never thought I'd be writing to you, but the problem persists. In the cold of winter, they freeze over and I can't do a thing with them; in the summer, they curl up and wrinkle. Please, Dr. Digital, I need help. My digits bother me so.

Besides all that—other people place *their* digits on top of mine! Really, Doctor, can't anything be done? They, of course say (mumble) "Excuse me," "S'cuse me," or "S'rry," but my digits ache anyway.

HELP!

Unfortunately, the letter had no signature or return address, so I'll have to reply in the column:

Dear Friend,

I think I have a solution to your problem that will reduce your digital problems by twenty percent *and* make you a better computer programmer.

My idea is this: Have two of your fingers removed. This way there will be fewer fingers to give you grief. In addition, you'll be a whiz with octal (base 8) notation. If you program in assembly language, base 8 will come in handy.

Your Friend,
Dr. Digital

REAL PROGRAMMERS

Are you a real programmer? There has been much written on what separates the real hams from the appliance operators, but not on how to tell the real programmers from the hackers. I offer the following guidelines. See how many *you* follow. Real programmers...

Use FORTRAN II
Use Intel Mnemonics for Z-80 work
Never use comments
Can read paper tape
Use obscure tricks
Use DSEGs
Understand the USING directive
Can get out of Witt's End
Prefer TECO or CP/M ED
Know RSX-11M
Never upgraded their computers from CP/M 1.4
Don't sign licensing agreements
Program in uppercase
Slash the letter "O" and not the number zero
Use 8" SSSD floppy disks
Program off the front panel
Feel PL/M is too high level
Play TOPS-10 Adventure, Lunar Lander, and nothing else
Use Dijkstra's picture for a dartboard
Call by name
Program for fun
Have an autographed picture of Knuth
Take their work home
Are usually poor

WE INTERRUPT THIS PROGRAM...

For the past few months, I've been discussing some ways computers are interfaced to external equipment, such as amateur-radio hardware. This month, I will continue the discussion with a description of interrupts.

If you've written programs of any sizable length, you have probably divided your code into subroutines. A subroutine is a section of code that is to be executed a number of times during a program's execution. It is invoked by a statement such as CALL, GOSUB, or JSR. For example, in 6502 assembly language, a subroutine call looks like this:

```
JSR SUB1
```

When this statement is executed, a number of things happen. First, the content of the program counter is stored in a special memory location called the stack. The program counter is a special register within the microprocessor that contains the address of the *next* instruction to be executed. After this is done, the address of the subroutine "SUB1" is loaded into the program counter. This causes the computer to branch to the subroutine.

After the subroutine is finished, program execution returns to the statement after the calling JSR. In 6502 assembly language, this is accomplished with the RTS (return from subroutine) statement. For example, subroutine SUB1 might look like this:

```
SUB1  CLC
      LDA #03
      ADC #99
      STA XYZ1
      RTS
```

The RTS essentially "undoes" the JSR statement. It takes the value of the program counter that was stored on the stack by the JSR statement and loads it back into the program counter. This causes the computer to resume program execution at the statement after the JSR. Because of the way that the contents of the program counter are stored, the subroutine can be called from any part of the main program and it will be able to return control to the main program.

Now that we have the concept of a subroutine out of the way, we can begin to look at interrupts. An interrupt is similar to a subroutine except that an external event, not a program call, causes it to begin execution.

Suppose you are using a computer to control a RTTY mailbox station that uses telephone lines for control purposes, such as turning the system on and off. One way of writing the software for the computer controller is to have it check the phone line every so often to see if a call is coming in. This would require a software branch to the telephone-checking subroutine as often as possible. This method is called "polling." The hardware that interfaces the computer to the telephone line is polled (examined) every so often to see if a call is coming in. Polling can waste a great deal of time, as well as slow the rest of the program down.

A much better way of doing this is to use interrupts. Every microprocessor has an interrupt input line of some form. If the telephone-interface hardware was connected to the interrupt line on the microprocessor, it would cause an interrupt routine to be executed. An interrupt routine resembles a subroutine. In 6502 assembly language, an interrupt routine might look like this:

```
INT   LDA #00
      STA TURNOFF ;turn transmitter off
      RTI
```

The STA statement stores a zero in a memory location that causes our hypothetical transmitter to shut off. Notice that the interrupt routine ends in an RTI instruction instead of an RTS instruction. This is because an interrupt request causes the status register to be saved on the stack in addition to the program counter. The RTI statement restores both the status register and the program counter to their original states. This way, the main program can resume execution as if nothing happened.

On the 6502 microprocessor, there are two interrupt connections, IRQ and NMI. The IRQ is a *maskable* interrupt, and the NMI is *non-maskable*. A maskable interrupt is an interrupt that can be disabled by setting a special bit in the status register. When this bit is set, the maskable interrupt (IRQ) is ignored. The NMI interrupt is always acted upon; it cannot be masked.

How does the computer know where to branch when an interrupt occurs? In the 6502, there are a number of special locations called interrupt vectors. These locations contain the addresses that the interrupt service routines start at. The vector location for the IRQ interrupt is hex locations FFFE and FFFF; the NMI vector is at FFFA and FFFB.

Next month, we'll explore interrupts further. On some of the newer processors, such as the 8086 and the 68000, interrupts are extremely complex. If one masters the use of microprocessor interrupts, one can design much more efficient computer-controlled devices.

SOCIAL EVENTS

Listings in this column are provided free of charge on a space-available basis. The following information should be included in every announcement: sponsor, event, date, time, place, city, state, admission charge (if any), features, talk-in frequencies, and the name of whom to contact for further information. Announcements must be received by 73 Magazine *by the first of the month, two months prior to the month in which the event takes place. Mail to Editorial Offices,* 73 Magazine, *Pine St., Peterborough NH 03458.*

BUFFALO NY
SEP 7-8

Ham-O-Rama and Computerfest 1984 will be held on Friday and Saturday, September 7-8, 1984, at the Erie County Fairgrounds (Buffalo Raceway, south of Buffalo NY). The hours on Friday are 6:00 pm to 9:00 pm and on Saturday 7:00 am to 5:00 pm. Admission is $4.50. Flea-market vendors' fees are $10.00 for indoor space and $3.00 for outdoor space. Features will include new equipment and video displays, computer demonstrations, technical and nontechnical programs, a chicken barbecue (new this year), and awards. Talk-in on 146.31/.91 (W2EUP/R) and 146.52. For more information, write Nelson Oldfield, 126 Greenway Boulevard, Cheektowaga NY 14225.

LARAMIE WY
SEP 7-9

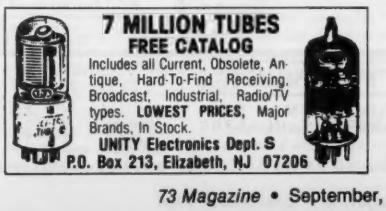
The Northern Colorado ARC, the University of Wyoming ARC, and the Shy-Wy ARC will jointly sponsor the fifth annual High Plains Ham Roundup on September 7-9, 1984, at the Yellow Pine Campground in the Medicine Bow National Forest (35 miles west of Cheyenne). There are no registration fees except for a modest Forest Service charge for campers. Saturday's schedule will include a campfire cookout and bring-your-own covered-dish extravaganza (barbecued hamburgers and liquid refreshments provided), with sing-along music and entertainment by regional talent. Also on Saturday will be a giant tailgate swapfest, a transmitter hunt, and technical displays. Talk-in on .22/.82 and .25/.85. For further information, write Jack Hayes W7CGK, 1321 E. 22 Street, Cheyenne WY 82001.

UNIONTOWN PA
SEP 8

The Uniontown Amateur Radio Club will hold its 35th annual Gabfest on the Saturday after Labor Day, September 8, 1984, on the club grounds located on the Old Pittsburgh Road, just off Route 51 and the 119 bypass, Uniontown PA. Registration is $3.00 each or 2 for $5.00. There will be free parking, free coffee, and a free swap and shop with registration. Refreshments will be available. Talk-in on 147.645/.045 and 144.57/.17. For further information, contact UARC Gabfest Committee, c/o John T. Cermak WB3DOD, PO Box 433, Republic PA 15475, or phone (412)-246-2870.

WINDSOR ME
SEP 8

The Augusta Emergency Amateur Radio Unit will sponsor the 1984 ARRL-sanctioned Windsor Hamfest on Saturday, September 8, 1984, at the Windsor Fairgrounds, Windsor ME. The gate donation is still $1.00 and camping will be available on Friday and Saturday nights. Features will include a flea market, programs, speakers, commercial distributors, light meals, and the tradi-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tional Saturday bean and casserole supper. Talk-in on the 146.22/.82 repeater. For further information, contact Don Hanson N1AZH, RFD #2, Box 3678, Greene ME 04236, or phone (207)-946-7557.

MARION IN
SEP 8

The 5th annual Grant County (Indiana) Amateur Radio Club hamfest will be held on Saturday, September 8, 1984, beginning at 8:00 am, at McCarthy Hall, St. Paul's Catholic Church, Marion IN. Donations are $2.00 in advance and $3.00 at the gate. Reservations for an 8-foot table are $2.00 each. Refreshments and free parking will be available. Talk-in on 146.19/.79 and 146.52 simplex. For more information and tickets, send an SASE to Jim Allman WD9EOI, 1108 Spencer Avenue, Marion IN.

MELBOURNE FL
SEP 8-9

The Platinum Coast Amateur Radio Society will hold its 19th annual hamfest and indoor swap-and-shop flea market on September 8-9, 1984, at the Melbourne Auditorium. Admission is $3.00 in advance and $4.00 at the door. Swap tables are $10.00. There will be food and plenty of free parking available, as well as awards, forums, and meetings. Talk-in on .25/.85 and .52/.52. For reservations, tables, and more information, write PCARS, PO Box 1004, Melbourne FL 32901.

SAN ANGELO TX
SEP 8-9

The San Angelo Amateur Radio Club will hold CEN TEX HAMFEST '84 on September 8-9, 1984, in the San Angelo Convention Center. Tickets are $5.00 in advance and $6.00 at the door. Hours for Saturday are noon to 6:00 pm and for Sunday, 8:00 am to 2:00 pm. Special events for the ladies include a Saturday afternoon tour of Fort Concho and Old San Angelo. There will be seminars and group meetings Saturday afternoon and Sunday morning, and a reception for dealers followed by a social hour for amateurs on Saturday night. Talk-in on 146.34/.94. For pre-registration or hotel/motel accommodations, write CEN TEX HAMFEST '84, PO Box 3751, San Angelo TX 76902.

BUTLER PA
SEP 9

The Butler County ARA, Inc., will sponsor their 7th Butler Hamfest on Sunday, September 9, 1984, from 9:00 am to 4:00 pm, at the Butler Farm Show Grounds at Roe Airport, Butler PA. The admission donation is $1.00 and children under 12 will be admitted free. The outside flea market is free and the indoor flea-market vendor's space is $5.00 per 8-foot table. Overnight campers will be welcome and there will be plenty of parking. Other overnight accommodations are available at area motels and fly-in accommodations are available at the airport. Talk-in on .96/.36, .84/.24, and .52. For more information, contact Dan Metrick WA3GDS, 131 Reiger Road, Butler PA 16001, or phone (412)-283-1719.

TORRINGTON CT
SEP 9

The CQ Radio Club will hold its hamfest on Sunday, September 9, 1984, from 8:00 am to 4:00 pm, at the Torrington Retirees Drop-In Center, East Albert Street. Admission is $2.00, tables are $7.00, and the fee for tailgating is $5.00. Talk-in on 146.05 and 147.24. For more information, write Donald D. Taylor KA1GKJ, PO Box 455, Watertown CT 06795.

MONETT MO
SEP 9

The Ozarks Amateur Radio Society will hold the 3rd annual Ozarks Amateur Radio Club Congress and Swapfest on Sunday, September 9, 1984, beginning at 11:00 am, at the Monett City Park, junction of highways US 60 and MO 37, Monett MO (between Springfield and Joplin). There is no admission charge and no charge for swap space (available on a first-come, first-serve basis). The buffet dinner begins at 1:00 pm (bring a single covered dish and share in the feast). Talk-in on the 146.37/.97 repeater and 7.250 MHz. For more information, contact the Ozarks Amateur Radio Society, Box 327, Aurora MO 65605.

CARTERVILLE IL
SEP 9

The Shawnee Amateur Radio Association will hold its 28th annual hamfest on September 9, 1984, at the John A. Logan Junior College Campus, Route 13 west, Carterville IL (6 miles east of Carbondale). Admission is $3.00 and flea-market tables are free. Activities will include forums, ladies events, and lunch served on the campus. There will be camping available across the road, motels nearby, and plenty of free parking. Talk-in on 3.925 from 8:00 am to 9:00 am and on 146.25/.85. For more information, phone Bill Johnson W9ERI at (618)-457-7586.

GRAND RAPIDS MI
SEP 15

The Grand Rapids Amateur Radio Association, Inc., will hold its annual Swap and Shop on Saturday, September 15, 1984, beginning at 8:00 am, at the Hudsonville Fairgrounds. There will be dealers, a concession, an indoor sales area, and an outdoor trunk-swap area. Talk-in on 146.16/.76. For more information, write Grand Rapids Amateur Radio Association, Inc., PO Box 1248, Grand Rapids MI 49501.

SEBASTOPOL CA
SEP 15

The Sonoma County Radio Amateurs, Inc., will hold their second annual hamradio flea market on Saturday, September 15, 1984, from 8:00 am to 2:00 pm, at the Sebastopol Community Center, 390 Morris Street, Sebastopol CA (5 miles west of Santa Rosa, just off Hwy. 12). Admission and parking are free. Tables are $5.00 in advance and $6.00 at the door. Vendor set-up starts at 7:00 am. Features will include a radio clinic, exhibits, refreshments, and an auction around noon. Talk-in on 146.13/.73. For tickets and more information, write SCRA, Box 116, Santa Rosa CA 95404.

MOBILE AL
SEP 15-16

The Mobile Amateur Radio Club will sponsor the Hospitality Hamfest on September 15-16, 1984, beginning at 9:00 am, at the Texas Street Recreation Center off I-10. Admission is free. There will be XYL/YL activities, swap tables, adequate parking, reasonable overnight rates, and good food. Talk-in on 146.22/.82. For more information, contact Porter Chambers KI4FE, 3320 Emelye Drive, Mobile AL 36609, or phone (205)-661-1160.

PEORIA IL
SEP 15-16

The Peoria Area Amateur Radio Club will hold its Peoria Superfest '84 on September 15-16, 1984, at the Exposition Gardens, W. Northmoor Road, Peoria IL. The gate opens at 6:00 am and the Commercial Building at 9:00 am. Admission is $3.00 in advance and $4.00 at the gate; children under 12 will be admitted free. Activities will include amateur-radio and computer displays, a huge flea market, a free bus to Northwoods Mall on Sunday, and a Saturday-night informal get-together at Heritage House Smorgasbord, 8209 N. Mt. Hawley Road, Peoria IL. There are full camping facilities on the grounds. Talk-in on 146.16/.76 (W9UVI). For reservations and more information, send an SASE to Superfest '84, PO Box 3461, Peoria IL 61614.

SUTTON NH
SEP 16

The Connecticut Valley FM Association will hold its 8th annual hamfest and flea market on September 16, 1984, from 9:00 am to 5:00 pm, rain or shine, at King Ridge Ski Area, Sutton NH (exit 11 off I-89). General admission is $2.00 and for dealers or flea marketeers, the fee for tailgating or tables is $3.00 each. Food will be available on the premises and there will be overnight camping only for self-contained units. Talk-in on 146.16/.76 or 146.52 simplex.

MT. CLEMENS MI
SEP 16

The L'Anse Creuse Amateur Radio Club will hold their 12th annual swap and shop on Sunday, September 16, 1984, from 9:00 am to 3:00 pm, at the L'Anse Creuse High School, Mt. Clemens MI. Take I-94 eastbound to the Metropolitan Parkway exit;

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then take the Metropolitan Parkway to Crocker; turn left on Crocker to Reimold and then right on Reimold to the last school, L'Anse Creuse High School. Admission is $1.00 in advance and $2.00 at the door. FCC representatives will be there, as well as plenty of new and used gear. There will be lots of food and parking. Talk-in on 147.69/.09 and 146.52. For more information, send an SASE to Maurice Schietecatte N8CEU, 15835 Touraine Court, Mt. Clemens MI 48044, or phone (313)-286-1843.

NEW KENSINGTON PA
SEP 16

The Skyview Radio Society will hold its annual hamfest on Sunday, September 16, 1984, from noon until 4:00 pm, at the club grounds on Turkey Ridge Road, New Kensington PA. Registration fee is $2.00 and vendors' fees are $4.00. Awards will be presented. Talk-in on .04/.64 and .52 simplex.

AUGUSTA GA
SEP 16

The Amateur Radio Club of Augusta will hold its annual hamfest on September 16, 1984, at Julian Smith Casino Park. Tickets are $1.00 each, 6 for $5.00, or 13 for $10.00. Features will include a flea market in the parking lot, a barbecue, refreshments, dealers, entertainment, and on Saturday evening, a hospitality room at Ramada Inn West, Washington Road, rooms 108–110. Talk-in on 145.49 – 600. For more information, send an SASE to D. F. Miller WB4YHT, Hamfest Chairman, 4505 Shawnee Road, Martinez GA 30907, or call 1-(404)-860-3700.

VENICE OH
SEP 16

The forty-seventh annual Cincinnati Hamfest will be held on Sunday, September 16, 1984, at Stricker's Grove, State Route 128, one mile west of Venice (Ross) OH. Admission and registration are $5.00. Features will include a flea market (radio-related products only), exhibits, music, talks, a hidden transmitter hunt, and an air show. Food and refreshments will be available. For more information, contact Lillian Abbott K8CKI, 317 Greenwell Road, Cincinnati OH 45238.

GRAYSLAKE IL
SEP 22–23

The Chicago FM Club will sponsor Radio Expo '84 on Saturday and Sunday, September 22–23, 1984, at the Lake County Fairgrounds, Rtes. 120 and 45, Grayslake IL. Tickets, good for both days, are $3.00 in advance and $4.00 at the gate. The flea market will open at 6:00 am and the exhibits will open at 9:00 am. There will be a giant outdoor flea-market area. Reserved indoor flea-market tables are available for $5.00 per day. Other features will include seminars, technical talks, ladies' programs, and free parking and overnight camping. Talk-in on 146.16/.76. For more information, send an SASE to Radio Expo '84, Box 1532, Evanston IL 60204, or phone (312)-582-6923.

VIRGINIA BEACH VA
SEP 22–23

The 1984 ARRL Roanoke Division Convention and 9th annual Amateur Radio/Computer Fair will be held on Saturday and Sunday, September 22–23, 1984, from 9:00 am to 5:00 pm both days, at the Virginia Beach VA Pavilion. Admission for both days is $4.00 in advance and $5.00 at the door. Flea-market tables are $5.00 for one day and $8.00 for both days. Features include dealers, special displays, forums, computer equipment, a giant flea market, free XYL bingo, and movies for the kids. For tickets and more information, write Jim Harrison N4NV, 1234 Little Bay Avenue, Norfolk VA 23503, or call (804)-587-1695.

WICHITA FALLS TX
SEP 22–23

The annual Wichita Amateur Radio Society Tornado Alley Hamfest will be held on Saturday and Sunday, September 22–23, 1984, at the National Guard Armory, Wichita Falls TX. The hours on Saturday will be 9:00 am to 5:00 pm and on Sunday, 9:00 am to 2:00 pm. Registration will begin at 9:00 am both days and is $4.00 per person in advance and $5.00 at the door. Pre-registration closes Wednesday, September 19th. There will be a large indoor flea market and tables are $3.00 each. Features will include commercial dealers' displays, computer dealers and demonstrations, ladies' activities, and special events. If you wish to take an amateur exam, send FCC form 610 to the hamfest address prior to August 17, 1984. A concession stand will be open both days. Talk-in on 146.34/.94, 147.75/.15, 449.30/444.30, and 449.20/444.20. For more information or pre-registration, contact WARS Hamfest, PO Box 4363, Wichita Falls TX 76308.

DANBURY CT
SEP 23

The Candlewood Amateur Radio Association will hold its annual flea market on Sunday, September 23, 1984, from 10:00 am to 4:00 pm, at the Elks Lodge, 346 Main Street, Danbury CT (exit 5 off I-84). Admission is $2.00 and tables are $7.00. Refreshments will be available. Talk-in on 147.72/.12. For advance table reservations, contact CARA, PO Box 2038, Danbury CT 06810. For more information, phone George Politzi KC2QF at (914)-533-2758, Rose Parrack WA1VOP at (203)-743-6834, or George Slater AF1U at (213)-438-0549.

GAINESVILLE GA
SEP 23

The 11th annual Lanierland ARC Hamfest will be held on September 23, 1984, beginning at 9:00 am, in the Holiday Hall at Holiday Inn, Gainesville GA. There will be free tables and an inside display area for dealers reserving in advance. A large parking lot will be available for the free flea market. Other features will include a left-foot CW contest, a ladies' country store, and many activities. Talk-in on 146.07/.67. For more information and reservations, contact Phil Loveless KC4UC, 3594 Thompson Bend, Gainesville GA 30506, or call (404)-532-9160.

WICHITA KS
SEP 23

The Wichita Hamfest will be held on September 23, 1984, at Camp Hiawatha, 1701 West 51st Street North, Wichita KS 67204. Features will include a flea market, programs, and commercial exhibits. For more information, contact Norm Tramba WA0HWH, 340 S. 1st, Clearwater KS 67026, or phone (316)-584-6425.

WILLIMANTIC CT
SEP 23

The Natchaug Amateur Radio Association will hold its annual giant flea market on Sunday, September 23, 1984, from 9:00 am to 4:00 pm, at the Elks Home, 198 Pleasant Street (off Route 32), Willimantic CT. Admission is $2.00 and children under 16 will be admitted free. Tables are $5.00 in advance and $7.00 at the door (dealers will be admitted at 8:00 am). Food, drinks, and free parking will be available. Talk-in on the 147.30/147.90 repeater and .52 direct. For more information, contact Ed Sadeski KA1HR, 49 Circle Drive, Willimantic CT 06226, or phone (203)-456-7029.

ADRIAN MI
SEP 23

The Adrian Amateur Radio Club will hold its 12th annual hamfest on Sunday, September 23, 1984, at the Lenawee County Fairgrounds, Adrian MI. Because tables are limited, reservations (by check or cash) must be made no later than September 15, 1984. For more information, tickets, or tables, contact Adrian Amateur Radio Club, PO Box 26, Adrian MI 49221.

ELMIRA NY
SEP 29

The Elmira Amateur Radio Association will present the ninth annual Elmira International Hamfest on September 29, 1984, from 6:00 am to 5:00 pm, at the Chemung County Fairgrounds. Activities will include an outdoor flea market, indoor dealer displays of new equipment, and breakfast and lunch served on the premises. Tickets are available at the gate or in advance from Steve Zolkosky, 118 East 8th Street, Elmira Heights NY 14903.

HAMILTON ONT CAN
OCT 6

The Hamilton Amateur Radio Club, Inc., will hold its 2nd annual flea market on Saturday, October 6, 1984, beginning at 8:30 am, at Marritt Hall, Ancaster Fairgrounds, 625 Highway 53 East. Admission is $2.00. Flea-market vendors' 8-foot tables are $4.00 plus admission and commercial vendors' 8-foot tables are $10.00 with admission included. There will be room for 150 vendors and setup will be from 7:00 am to 8:30 am. Coffee, soft drinks, and sandwiches will be available. Talk-in on 146.16/146.76 (VE3NCF). For space reservations, contact HARC Flea-Market Committee, PO Box 253, Hamilton ONT L8N 3C8. For more information, contact Stan VE3GFE on VE3NCF.

WARRINGTON PA
OCT 6–7

The Pack Rats (Mt. Airy VHF ARC) cordially invite all amateurs and their friends to the 8th annual Mid-Atlantic VHF Conference which will be held on Saturday, October 6, 1984, from 9:00 am to 5:00 pm, at the Warrington Motor Lodge, Route 611, Warrington PA, and to their 13th Pack Rat Hamarama on Sunday, October 7, 1984, from 7:00 am to 4:00 pm, rain or shine, at the Bucks County Drive-In Theater, Route 611, Warrington PA. The conference will feature an all-day VHF program, a cocktail hour and get-together at 6:30 pm, and a buffet dinner ($13.00 each) at 7:30 pm. Conference registration is $4.00 in advance (before September 23rd), $5.00 at the door, and includes admission to the Hamarama. Admission to the Hamarama flea market on Sunday is $3.00 and selling spaces are $5.00 each. The gate will open at 6:00 am for sellers (bring your own tables). Food and drink will be available. Talk-in on 146.52 MHz (W3CCX). For more information, contact Hamarama '84, Post Office Box 311, Southampton PA 18966, or phone Lee A. Cohen K3MXM at (215)-635-4942.

BALTIMORE MD
OCT 7

The Columbia Amateur Radio Association will hold its 8th annual hamfest on Sunday, October 7, 1984, from 8:00 am to 3:30 pm, at the Howard County Fairgrounds (15 miles west of Baltimore, just off I-70 on Route 144, 1 mile west of Route 32). Admission is $3.00 and XYLs and children will be admitted free. Tables are $6.00 additional if paid by September 30th and $8.00 additional after that date. Outdoor tailgating is $3.00 additional and indoor tailgating is $6.00 additional. Food will be available. Talk-in on 147.735/.135 and 146.52/.52. For table reservations and more information, write Mike Vore W3CCV, 9098 Lambskin Lane, Columbia MD 21045, or phone (301)-992-4953.

SYRACUSE NY
OCT 13

The Radio Amateurs of Greater Syracuse 1984 Hamfest will he held on Saturday, October 13, 1984, beginning at 9:00 am, at the Art and Home Center Building, New York State Fairgrounds, Syracuse NY (adjacent to Interstate 690, just 3 miles southeast of the NYS Thruway, exit 39, and one mile northwest of Syracuse and Route 81). The hamfest will have complete indoor facilities and, weather permitting, there will be an outdoor flea market in the front courtyard. Volunteer exams will be given for Novice, Technician, and General classes. Breakfast and lunch service will be available. Commercial exhibitors may begin their setup on Friday from 7:30 pm to 10:00 pm and on Saturday from 7:00 am to 9:00 am.

DOVER MA
OCT 20

The Middlesex Amateur Radio Club will hold its annual Amateur Flea Market on October 20, 1984, from 9:00 am to 3:00 pm, at Dover Town Hall, Dover MA. Admission is $1.00 and tables are $8.00 each. Refreshments and ample free parking will be available. For further information, send an SASE to Irv Geller KO1N, 1450 Worcester Road, #422A, Framingham MA 01701.

LETTERS

MASS. CLASSES

We're sponsoring Novice and Technician/General classes to be held at Chelsea High School (Chelsea MA) starting September 18, 1984. Classes will be held on Tuesday and Thursday nights from 7:30 to 9:00 pm. The classes are free, but the cost of materials will be paid by the students. For information, contact me at the address below (please include your phone number).

Frank Masucci K1BPN
c/o 1979 Amateur Radio Association
PO Box 171
Chelsea MA 02150

REVIEW

PROPAGATION BY MUFPLOT

If you own an Apple or Commodore computer, MUFPLOT, from Base (2) Systems, 2534 Nebraska Street, Saginaw, Michigan 48601, will make propagation predictions a cinch! Both the Commodore 64 and the Apple II versions were reviewed. They operate in virtually an identical fashion. A VIC-20 version is also available.

Scientists have been making radio-frequency-propagation predictions for years. It used to be a very tedious process that took hours to determine the best frequency between two points. Good math skills and the ability to put a slide rule through its paces were required. With the home computer, it's now possible to let your fingers do the walking!

Since the public became aware of the "Mini-Muf" program created by Bob Rose and his fellow scientists, the market has been flooded with MUF (Maximum Usable Frequency) programs. Some of them are overpriced. Some of them are just poorly conceived. MUFPLOT on the other hand is an excellent example of a good dollar value, delivering a lot of features for the price.

The instructions for MUFPLOT take about 18 small pages. The program is written well enough that many computerists are able to operate it without ever seeing the book!

MUFPLOT will calculate for you the maximum usable frequency, the highest possible frequency (HPF—good for six-meter DXers), or the frequency of optimum traffic (FOT). Additionally, the lowest usable frequency (LUF) is calculated.

Many of the MUF programs on the market do these things. What sets MUFPLOT above many of them are several additions that make the necessary inputs as simple as possible.

When first using the program, it will be necessary to enter your exact latitude and longitude. This information is stored to disk so that MUFPLOT will have the information for all future sessions. The information can be changed easily, should you move or wish to calculate predictions for an area other than you own.

You must enter the end point of the transmission path you wish MUFPLOT to calculate. The beauty of this input is that you can select one of several different methods to specify the location. You may enter the DX prefix, the US postal abbreviation, or a specific latitude and longitude.

You can output the plot adjusted to whatever time zone you wish to use.

Like all MUF programs, you must enter the solar-flux data received from WWV. It's then time to get on with the computations!

Unless you tell it otherwise, MUFPLOT will show the MUF as the upper line on the graph. You may select FOT or HPF and the graph will be changed accordingly.

After just a few seconds, MUFPLOT will begin plotting the graph on the screen. Both the C-64 and Apple II graphics presentations were quite nice. The Apple II version, displayed on an amber monitor screen, was particularly sharp.

If you would like a printed copy of the graph, simply select the print option. You may output as many copies as you like. Standard ASCII characters are used, so the high-resolution graphics presentation is diminished somewhat. This was considered only a very minor trade-off.

As a bonus, MUFPLOT also gives you the correct distance and beam heading from your location to the DX location.

MUFPLOT is supplied on disk. The C-64 version uses complied Basic (Petspeed) as does the Apple II version. This means faster operation for you. The programs can be backed up, though the C-64 version comes with a "MUFKEY" which must be inserted in the joystick port for proper operation. Failure to do so results in a very interesting "STOLEN" message running across your screen!

If you've been looking for a very versatile MUF program, MUFPLOT may be your answer. It is highly recommended.

For further information, contact *Base (2) Systems, 2534 Nebraska Street, Saginaw MI 48601.* Reader Service number 484.

Jim Grubbs K9EI
Tim McDonough WD9EDT
Springfield IL

A LOOK AT THE ICOM 271A

Two meters. Those two words inspire varied thoughts for different people. To some people, two meters means exciting sporadic-E DX communications, to others, transcontinental Mode-A satellite communications or local SSB chats. Of the many uses for the two-meter band, the most popular is FM-repeater operation. No matter what two meters brings to your mind, one fact is clearly evident: The technology involved in two-meter communications equipment has rapidly advanced during the past few years.

A quick glance to compare an amateur-radio magazine printed a few years ago with a more recent issue is evidence of the incredible advancements that have been made in amateur communications equipment. All areas of amateur communications have changed, from the usual low-band units to the recent computerized RTTY stations. Not overlooked by the jump in technology during the last few years is the ever-popular two-meter radio.

Today, the fully-synthesized two-meter radio with its multitude of memories and other functions is the standard. However, it was not too many years ago that crystallized rigs were the norm. Hand-helds were bulky and offered only five or six channels. Scanning was a rare luxury and rigs that covered the entire two-meter spectrum were often of poor quality. It is difficult to imagine the days when these radios were common, especially for newcomers who glance through the ads in magazines and see the advanced equipment of today.

Rigs with new and innovative features have been coming out repeatedly. Two built-in vfo's, memories, all-mode squelch, digital displays, and even voice synthesizers are examples of the many advancements that have been made in commercial equipment over the past few years. Today's HF rigs include most of these features as standard equipment; however, until recently, a two-meter rig with most of these advanced features incorporated together has been a dream.

Icom's latest introduction to the two-meter world, the Icom 271A, fits the bill of the ideal two-meter rig very nicely. This rig combines most of the features any two-meter operator could ever want. The ideal rig? Perhaps. Read on and see!

Specifications

The unit has many features which make it a joy to operate. The vast majority of operating capabilities are under the direct control of a microprocessor. Two separate vfo's can be used independently or together for either simplex operation or split operation with any desired split. There are 32 memories available; each can store the operating frequency, mode, offset (if any), and a PL™ tone which is generated by an internal PL tone encoder. The encoder is a very handy feature for use with closed repeaters, remote-control applications, etc., and the fact that it's built-in means one less piece of equipment sitting on your shelf!

The front panel of the unit is designed with the user in mind. A good-sized tuning knob and continuous wraparound tuning (which allows tuning off the top end of the band and continuing from the bottom of the band) allow for easy tuning. One of the more enjoyable features of the radio is its two-color luminescent display. It displays all the information needed for logging purposes (operating frequency, offset direction and amount, the vfo in use, the operating mode, receiver incremental tuning degree, memory channel, and PL tone). Of course, not all the information can be displayed at one time! All this is displayed in two colors: red and blue. The unit operates on the standard twelve volts supplied by most power supplies, or an external ac power supply can be purchased as an option. These features, and many more, when utilized to their fullest extent can handle almost any conceivable operating situation.

Before we continue with the many features and capabilities of the radio, let's take a look at its design. The radio's physical appearance is very attractive; its sleek gray finish fits in with most other modern radios. Despite its many innovations, the unit has been carefully designed to match other Icom radios as well as most other modern radios in the same class.

Design and Features

The case itself measures 110 mm(H) × 285 mm(W) × 275 mm(D), and the unit weighs 5.2 kg. The Antenna connector, which is the standard 50-Ohm, unbalanced PL-259, is located on the back panel. Also located on the back panel are the Keyer jack, the Ground connection, the External-Speaker jack, the Power-Supply plug, and a removable plate for use with the optional internal power supply. On the left side of the radio are four rubber feet so that it may be stood up on its side. Located on the right side is a handle for easy portability. The bottom has the usual rubber feet and a fold-down stand that lifts the front of the unit an inch or so above the operating surface. The top panel is barren except for vent slits and an enclosure which houses the VOX controls. Now all sides are accounted for except for the one most often seen; the front panel.

At first, the dazzling array of buttons and knobs may be awe inspiring, but as you will soon see, they are arranged by function and are easy to use. In fact, many of the switches are rarely touched after the initial programming of the radio. However, they are there for use whenever an unusual operating condition presents itself.

The first thing that most people notice when they first see the radio is its digital display. The dual colors make for an easy inspection of the current setting of the radio without looking all over at many different switches. Since you have already been introduced to the display, we will leave it for a while then return to it, for it is the central area where current information is displayed.

To the left of the display is the meter. This meter provides a lot of information. It can serve as a signal-strength indicator, a relative-power output meter, and an FM reactance meter. Of course, the mode the radio is in determines what is displayed on the meter. It is back-lighted and is very easy to read in dim light or darkness, and the comparatively large print used on the meter helps.

Between the display and the meter are three LEDs which indicate Transmit mode, Receive mode, and PL tone on. They are easy to see, and each is a different color so they are easily identified in poor lighting conditions where reading the labels would be difficult.

To the left of the meter are six buttons which are used mostly in the programming of the unit's memories. The OW (offset write) button is used to change the frequency of the offset to any desired split, and the + Duplex and – Duplex buttons are used to indicate the direction of the offset. Both the offset and its direction can be stored along with other information in the unit's 32 memories.

Located in the same group of six buttons are the PL tone select switches, which again are used mostly during the programming of the memories. The Tone button turns on the internal encoder so that the indicated tone will be transmitted. The Select button is used to choose one of the 32 available tones, which can be stored along with the other information in the memories.

The IC-271A two-meter transceiver from Icom.

Finally, the last of these six buttons is the Check switch. It is similar to the Reverse button on many other two-meter radios in that it allows you to change the receive frequency by increasing or decreasing it by the offset stored with the frequency. Using this feature, you could check the input of a repeater to see if you could hear the other party without the aid of the repeater, and thus determine if simplex operation is possible. The check feature is activated only as long as the button is depressed.

The lower left corner of the front panel contains the greatest number of buttons and knobs. The Power switch, a push-in locking switch, is located in the middle of the row of switches at the far left. Directly below the Power switch is the Transmit/Receive switch. It is the usual lever switch and is used mostly on CW. The microphone connector is the next in line and is an 8-pin connector with the capability for remote up/down frequency control. The Mode buttons are located to the right of the Power and T/R switches.

The modes available are (from top to bottom): FM, USB, LSB, and CW. These are not locking switches, and when they are pressed, the mode indicator in the display switches to the correct mode, and when released, the switch returns to its original position. Next to the Mode buttons are several function buttons. These switches lock and must be pressed again to return them to their normal state. They are (from left to right): VOX, NB (noise blanker), AGC (automatic gain control), Meter, Preamp, and Mode Scan.

The VOX is simple enough; press it in when you want the transmitter to trip whenever there is a signal loud enough to trip the threshold control which is located under a panel on the top of the radio. However, the VOX only works in the SSB and the CW modes, not in the FM position.

The noise blanker is easy to use also. Whenever there is any interference coming into the radio, push the button in. It will attenuate electrical pulse noise from the power line and the air; however, it is fixed and not variable.

The Meter switch is used for switching between the two functions of the meter when in the Receive mode. It is a relative-power indicator when in the Transmit mode. However, it can serve as either an S-meter or an FM reactance meter depending on which position the switch is in.

The Preamp switch kicks in the optional preamp when it is needed. However, without the preamp installed, the switch does nothing no matter which position it is in. In short, the switch is useless until the optional preamp is installed.

The last of the function switches is the Mode Scan. It is used when you want to scan memories that contain only a selected mode. For example, it could be set to FM and scan only only those memories which contained FM as their mode. Such a feature could be used for selectively scanning the local repeaters or for the satellite beacons, etc.

Three knobs and the Phones jack are located below the function switches. The Phones jack is the standard 0.25-inch phono-plug jack. The knobs each contain concentric dials and thus each serve a dual purpose.

The first concentric knob moving from left to right is the AF/RF Gain. It, of course, is used to set the volume of the audio and the level of the rf gain. Next in line is the Squelch/Tone knob. By turning these, you can set the all-mode squelch so that no sound will be heard unless there is a signal present on the frequency. Also, the tone of the audio can be adjusted. The last knob on this row is the Mic Gain/RF Power. The Mic Gain is used to set the drive from the microphone necessary to modulate the output signal, and the RF Power is used in conjunction with the relative-power output meter to adjust the power output up to 25 Watts.

Located beneath the digital display and to the right of the function switches are the main tuning knob and a few other buttons. The tuning knob is very civilized and responds well. It's weighted perfectly and rotates effortlessly. To the lower left of the tuning knob is a small square switch. It is used to lock the display in order to prevent accidental frequency change from bumping the tuning knob or inadvertently pressing a button. It is also used in conjunction with the optional internal speech synthesizer when it is installed.

To the right of the tuning knob are three switches (from top to bottom): TS (tuning step), DFS (dial function select), and Split. The first, tuning step, is used to change the tuning increment to 1 kHz in any mode. The 100-Hz digit on the display is cleared to show 0. The tuning returns to normal increments when the switch is released. This function allows quick QSYing over a great frequency range in SSB and CW and tuning to FM signals which are not located on the standard 5-kHz step.

The next switch in line, the dial function select, serves two purposes, depending on whether you are in memory mode or using the vfo. If you are tuning with the vfo, the switch allows you to lock the vfo and use the tuning knob to rotate through the 32 memories. If you are recalling memories, activating the switch will cause the memory-channel select to lock; the tuning knob now serves to adjust the frequency.

The last switch is the Split switch. It is used to allow the unit to operate at any conceivable split. By activating the switch, one vfo is used for the transmit frequency and the other is used for the receive frequency. Whichever vfo was in use when the switch was pressed will become the receive frequency.

To the right of the tuning-knob area are another knob and a few more switches. The knob is the RIT. The RIT is used to adjust the receive frequency by up to 9.9 kHz in either direction. This is very useful for sensitive fine tuning where you do not want to disturb the transmit frequency knob. The knob is activated by pressing the RIT button, and the RIT is cleared by pressing the Clear button.

Below the RIT controls are MHz Up and Down switches. Because the two-meter band is so large, tuning up and down the band with the tuning knob would take quite a while, not to mention how tiring it would be! To prevent this problem, the MHz Up and Down switches were added. You can jump up or down in 1-MHz steps with a press of the appropriate switch.

The last group of switches in the front panel is located to the right of the display and above the RIT controls. These six switches control the operation of the vfo and the memories. The A/B switch is used to switch between vfo's A and B. The A = B switch is used to set the two vfo's to the same frequencies. The VFO/M switch is used to switch between the vfo mode and the memory mode. In the vfo mode, the tuning knob is used to change the frequency of the vfo. However, in the memory mode, the tuning knob is used to select one of the 32 memories. The Write switch is used to write all the information indicated on the display into the memory. The M-VFO switch is used to put the contents of a memory into a vfo, and the Scan switch is used to either scan through the memories, or to scan through a selected range of frequencies within the limits determined by the contents of the first two memories.

Now that you are well aware of the many features of this radio and how they work, we can look at how they are applied in typical operating situations. The number of buttons and switches may seem imposing at first, but they are easy to learn and even easier to use. All these features may seem a bit much, but as you will see, they can be utilized effectively to increase your operating pleasure in all but the most simple situations.

When I first received the radio, it took me about 10 minutes to set it up and attach it to my TS-130 power supply. After playing with it for a few minutes I decided it was time to break out the manual and put it through its paces. After tuning around and punching the buttons, I learned that not using the memories takes away a lot of the radio's capabilities, so I tried to program one.

Memories

The manual gives clear examples of how to program the memories and after the first one was programmed, the manual was no longer needed. Reserving the first two memories for the upper and lower frequencies for the band-scan feature, I decided to put a local repeater into the third memory. First I set the mode to FM and tuned the vfo to 145.23 MHz, which is the output frequency of the repeater. Then I set the offset to 600 Hz by pressing the offset write button and turning the tuning knob until 600 was displayed. Next I pressed the – Duplex button to register the offset as negative, and I was done. However, if the repeater had required a PL tone for access, I could have entered it also by pressing the Tone Select button and turning the tuning knob until the desired tone was displayed.

In order to store the specifications I had just set into memory three, I put the radio in the memory mode by pressing the VFO/M button and turning the tuning knob until memory 03 was displayed on the right side of the display. Next, I double-checked the display to make sure the information was entered correctly. Yes, the display indicated the correct frequency, offset, mode, and memory, so I pressed the Write button and the information was entered in memory 3. The same procedure was repeated for the other repeaters I wanted to enter into memory, changing only the frequency, offset direction, etc., depending on how different this repeater was from the one I'd just entered. By canceling out the offset, simplex frequencies can be entered along with their modes, i.e., 146.52 FM, 144.30 CW, 144.85 SSB, etc.

Now that there were several frequencies stored in the memories, I was able to recall them by putting the radio in memory mode and turning the tuning knob. As each memory was displayed, the information was automatically entered to the display and the radio was ready to operate as set in that memory. By pressing the Scan button in the memory mode, the radio scans through the 32 memories and stops whenever a signal interrupts the squelch. After a few seconds, it continues scanning. Pressing the Scan button again will stop the scanning.

To put the contents of a memory into a vfo, I recalled the memory in the memory mode, then pressed the VFO/M button again to enter the vfo mode. By pressing the M-VFO button, the memory contents were entered into the indicated vfo. Now I was able to take advantage of the vfo while retaining the desired memory specifications.

Operating the Radio

As you can well imagine, all of these features along with the memories can make operating two meters a lot of fun. The versatility of the rig and its ability to adapt to different operating habits ideally suits this radio to any two-meter user. I have used the rig under many different operating conditions and have always been pleased with its performance.

I was able to put the radio through a test during the VHF sweepstakes and it performed beautifully. I ran it at a full 25 Watts into a 10-element yagi mounted in the attic and had some surprising results. My most distant contact was Connecticut from my home near Philadelphia, Pennsylvania. This was very good considering the number of people that were calling him also. I found the noise blanker to be a useful feature and my audio reports on SSB and FM were excellent. I tried to utilize every feature during the contest and found them all to be a great help.

The radio's precise tuning and the RIT feature make it excellent for satellite use. Although I received the radio too late for use in the recent space shuttle mission, I am sure its features would have been a great help. The quick access to the memories would have been a great boost in monitoring all the transmit and receive frequencies.

The radio performs just as well under more conventional operating conditions such as rag-chewing, repeaters, and nets. Because the memories may be set up in any manner, the radio may be customized to any user's typical operating conditions. The more exotic features such as the unlimited splits are there when you need them and are not hard to use. My radio has been operated on all modes from CW to RTTY (AFSK) and is testament to the great versatility of the rig. This is the super rig that every two-meter buff has dreamed of. And, if the built-in features are not enough, there is a wide array of options available.

Options

Among the options available, the internal power supply and speech synthesizer have already been mentioned. Other options include a PL tone decoder and a computer interface. Of course, the usual array of microphones and other accessories is available. The radio comes equipped with an up/down mike, but it lacks touch-tones™, so the touchtone mike is one of the first accessories you should look at. Also, a more powerful version of the 271A is available, the IC-271H, which has an output power of up to 100 Watts. A version is also available for the 440-MHz band, the IC-471.

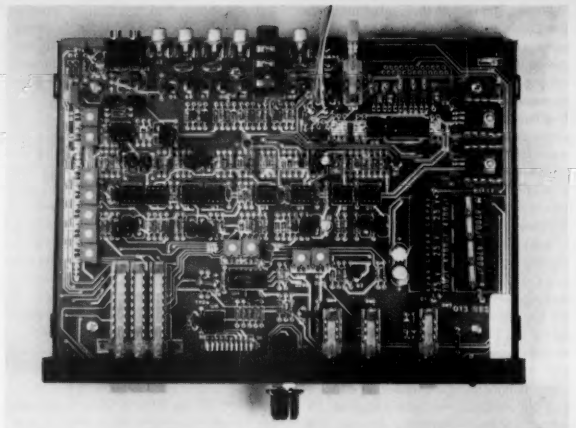
Conclusion

Overall, I was very pleased with the

WHAT DO *YOU* THINK?

Have you recently purchased a new product that has been reviewed in *73*? If you have, write and tell us what *you* think about it. *73* will publish your comments so you can share them with other hams, as part of our continuing effort to bring you the best in new product information and reviews. Send your thoughts to Review Editor, *73: Amateur Radio's Technical Journal*, Peterborough NH 03458.

AEA's CP-1 Computer Patch.



Interior view.

radio, both in its design and operating abilities. It is definitely a first-class rig which is sure to be a big success. I got the last one the store had in stock! If Icom is listening, a VOX for FM would be nice. It is available for hand-helds and should be included in this excellent rig. I have just about run out of words of praise for this stupendous transceiver. Let it suffice to say that this rig would top my list of necessary equipment for two-meter operation.

For further details, contact *Icom America, Inc., 2112 116th Ave. NE, Bellevue, WA 98004; (206)-454-8155.* Reader Service number 486.

Jonathan Mayo KR3T
Media PA

THE AEA CP-1 COMPUTER PATCH

Many amateurs have joined the computer revolution in the past few years. The availability of inexpensive microcomputers has resulted in the appearance of approximately 100,000 of these units in ham shacks around the world.

As it comes, the home computer lends itself well to logging chores, dupe checking, and propagation prediction. All of these applications require software only. To realize the full potential of a computer in the ham shack, one or more hardware interfaces is required to safely interface the micro to the amateur-radio equipment.

Some of the most popular applications for a computer include sending and receiving RTTY, AMTOR, ASCII, and even CW. Numerous software packages are available to teach your computer how to speak these "foreign" languages. The best software in the world is nearly useless if the incoming signal does not accurately convey the received data.

The AEA people have designed the CP-1 Computer Patch to match virtually all makes and models of amateur transceivers and separates to most home computers. It does its job extremely well. AEA has been making code and RTTY readers for some time. The CP-1 is a logical extension of the technology developed in these units.

One of the first things you notice when you take the CP-1 out of the box is its relatively small size. The old vision of everything having to do with RTTY being big and bulky is finally dying. The style is very clean and makes a pleasing addition to the ham shack.

An exploration of the inside of the CP-1 reveals superior construction techniques. The circuit board has the look and craftsmanship of the highest-quality commercial gear.

Connection of the CP-1 is relatively simple. The detailed and easy-to-read instruction manual makes the task painless. A connection from the audio output of your rig is needed for reception. A cord from the CP-1 to the microphone jack of your radio will also be needed if you wish to transmit.

An external power adapter is provided with the CP-1. Often this is an extra-cost item with other interfaces.

With the CP-1 connected and some software loaded in your computer, you are ready to go! The controls on the front panel of the interface are straightforward.

After turning the power on, you need to select the shift you wish to use. Three push-buttons allow selection of a narrow bandwidth for CW reception, or a 170-Hz bandwidth for standard RTTY reception. In addition, a variable shift position allows reception of virtually any nonstandard shift up to 1000 Hz.

The center frequency of the bandpass filters in the CP-1 is also changed depending on your selection of CW or RTTY reception. In the CW mode, the filters are centered around 750 Hz, the frequency most CW filters in transceivers are tuned to. For RTTY, the center frequency is shifted up above 2125 Hz to accommodate standard RTTY audio frequencies.

Though the CP-1 will receive almost any shift, it is designed to transmit only 170-Hz tones. A simple modification outlined in the instruction manual will allow 850-Hz transmission if you need it for MARS or other work.

How well does it work? In side-by-side comparisons on regular amateur transmissions, the CP-1 often provides the best reception of even very weak signals. There are several notable things about the CP-1's performance.

Adjacent signal rejection is superb! Many computer interfaces fall a bit short in this category, but the CP-1 compares favorably to sophisticated terminal units. It is possible to tune to even a weak signal with a very strong signal nearby and realize virtually 100-percent copy.

An indication of the clean signal coming from the CP-1 is highlighted when tuning between signals, or when the frequency is idle with only background noise present. Many interfaces will try to interpret the random noise and signals as real data. The CP-1 provides a "quiet" output under most conditions, keeping the computer screen clear until a signal is properly tuned.

The tuning indicator provided on the CP-1 does a good job, performing almost as well as a tuning scope. For the purist, scope outputs are provided on the back of the unit.

No problems were encountered using the unit on transmit. Provisions are made to match the level and keying requirements of most equipment.

I tested the CP-1 with MBATEXT, AEA's software package, HAMTEXT and HAMSOFT from Kantronics, and numerous programs of my own design. It performed well with all of them.

If you are interested in copying commercial transmissions, the variable shift feature is a must. Most transmissions outside of the amateur bands occur at 425- or 850-Hz shift. The CP-1 adequately provides reception at these shifts. Adjustment of the variable shift control requires some learning, but the instruction manual provides the instructions you need to properly tune the CP-1 in this mode.

The AEA CP-1 has a suggested list price of $239, though it is currently being offered by many dealers at a much lower cost. Additionally, the CP-1 is sold in packages with AEA software at an even greater savings for the packages.

If you are looking for an excellent dollar value in a computer patch, the CP-1 is hard to beat. It is highly recommended.

For more information, write *AEA, PO Box C-120, Lynwood WA 98036.*

Jim Grubbs K9EI
Springfield IL

Rear-panel view.

DX-1 PROPAGATION SOFTWARE FOR THE APPLE

Knowing when and where to listen for DX is half the battle in logging a new country or prefix. If you own one of the Apple II series of computers, the DX-1 program from DX Enterprises, 5861 Bridle Way, San Jose, California 95123, can provide you with very detailed propagation information.

DX-1 is much more than just an implementation of the popular maximum usable frequency program. It provides at least one feature that no other propagation program that I have seen includes.

For those of you who are interested in the programming aspects of computing, you may find it interesting that DX-1 is written using the Pascal language. Virtually all of the other propagation programs are written in some version of Basic. Pascal is a structured language that its proponents feel allows programming in a very logical fashion. No program line numbers are used.

The DX-1 package takes a machine with 64K of memory and one disk drive. Loading the package takes something just under four minutes. The long load time occurs because the Pascal language must first be loaded in, and then information on more than 400 unique radio locations is absorbed by the computer.

Operating the program is made easier by reading the manual as you input the requested information. Numerous examples are contained in the twenty-page book that accompanies DX-1.

You will need to know your latitude and longitude. Unlike similar programs, DX-1 does not store this information anywhere for you. This was considered a minor inconvenience.

Selecting the target area is quite easy. You may input coordinates for a specific location, or you may use the information contained in DX-1 to search by country. It's not even necessary to know exactly how to spell the target area. For example, Sri Lanka was found by asking DX-1 to search for SRI. If the computer is unable to outguess you, backward and forward scrolling through the list will locate the country you have in mind.

As soon as you input your location and the date, the program calculates sunrise and sunset for your location. Be careful! The times given are in GMT (or UTC if you prefer) *not* local time! A similar calculation is made on the target area.

As with all MUF programs, you will need the 10.7cm solar-flux reading. DX-1 also requires the geomagnetic "A" index. Both are available at 18 minutes past the hour from WWV. The additional use of the A index and other calculations allow DX-1 to calculate a "quality" factor for the path.

After inputting the information, it's time to sit back and wait about half a minute for DX-1 to do its thing. The information is displayed on the screen in table form. If desired, the screen information can be sent to your printer for a more permanent record.

DX-1 will also calculate the frequency of optimum transmission (FOT) when requested. This, too, can be sent to the printer.

Additional "nice-to-have" information, such as beam headings for short and long paths, distances for both, and the prefix for the target area, is displayed.

The area in which DX-1 shines, if you will pardon the pun, is in greyline calculations. Old-time DXers and SWLs know that enhanced conditions exist between two points when both are undergoing sunrise or sunset at the same time. DX-1 will tell you what to look for during these conditions on any given day.

Even the width of the greyline area can be specified. Normally a 15-degree width is adequate. Since there are 24 hours in a day and a circle has 360 degrees, the 15-degree width corresponds to a one-hour window, or 1/24th of a day.

Greyline calculations are complex and time consuming. It takes about five minutes for DX-1 to do the job. When selecting greyline calculations you must specify whether you want the output to go to the screen or to the printer. You cannot go back later and print what you saw on the screen without DX-1 going through all of the calculations again.

The programmers of DX-1 deserve some applause for taking the time to format the printout of the greyline calculations. A form feed is issued so nothing is typed on the perforations. The headings are also duplicated at the top of each page. A nice touch!

DX-1 was judged to be of great value to the serious DXer. Some of the times involved in loading and calculating suggest that DX-1 might be better suited to everyday operations rather than a contest situation where you might be using your computer for other things, like logging for example, at the same time.

The absence of a graph-type display of the MUF and FOT is a minor flaw in DX-1. The information provided in table form is of course just as accurate, perhaps even more so.

If your interests are a bit more routine, a somewhat more compact version, minus the greyline-calculation option, is available. It is called DX-2 and was not reviewed.

Take a byte out of propagation prediction! DX-1 for your Apple computer will help do the job.

For more details, write *DX Enterprises, 5861 Bridle Way, San Jose CA 95123.* Reader Service number 485.

Tim McDonough WD9EDT
Springfield IL

NEW PRODUCTS

PACKET RADIO CONTROLLER FROM AEA

Advanced Electronic Applications, Inc., has announced the introduction of the Model PKT-1 packet radio controller through an arrangement with Tucson Amateur Packet Radio, Inc. (TAPR), Tucson, Arizona. AEA started delivery of the PKT-1 to its dealers in June.

The PKT-1 is a packaged and warranted version of the well-known TAPR do-it-yourself kit board with version 3.1 software, and includes application assistance and a year's conditional warranty. More than 1000 users of the TAPR kit board now exist throughout the world.

Packet radio is a burst mode of data or text transmission utilizing AFSK, FSK, or PSK modulation. On VHF it runs at 1200 baud typically, and uses CRC error checking, ensuring an extremely low error rate. Multiple users may share a simplex or duplex channel simultaneously on a time-share multiplexed basis.

Any packet station using the PKT-1 may operate as a store-and-forward repeater (digipeater) for someone else's transmission while concurrently functioning as a regular packet station. Up to 8 digipeating stations may be used between two terminal stations. Digipeating allows routing the transmission path around physical obstacles blocking a line-of-sight radio path and allows extending the link beyond line-of-sight distances.

For more information, contact your closest AEA dealer, or *AEA, PO Box C2160, Building O&P, 2006-196th SW, Lynnwood WA 98036-0918; (216)-775-7373.*

AMTOR CONVERTER FROM INFO-TECH

The new Info-Tech M-44 AMTOR converter allows most RTTY terminals to be used on the recently-approved AMTOR RTTY mode. Interface to the terminal is via serial TTL or RS-232 levels, and either ASCII or Baudot terminals may be used.

The unit also features a built-in modulator and demodulator with pre-filter, full-time ATC, and two transmit buffers. All control of the M-44 and transceiver is by simple commands entered via the terminal keyboard.

This converter is American designed and manufactured and will operate in the ARQ, FEC, and ARQ-monitor modes.

For more information, contact *Digital Electronic Systems, 1633 Wisteria Court, Englewood FL 33533.* Reader Service number 478.

REGENCY ELECTRONICS 20-CHANNEL SCANNER

Regency Electronics, Inc., now offers a 20-channel programmable scanner with complete, continuous coverage from 25 to 550 MHz. This receiver has microprocessor control for direct keyboard entry of frequencies. The Regency MX-5000 is available at participating Regency Electronics dealers.

The MX-5000 scans two to twenty channels automatically, or channels may be selected manually. Its wide coverage includes high and low VHF, UHF, and UHF "T" for police, fire, emergency services, business band, marine radio, radio-telephone, and National Weather Service broadcasts. It covers VHF aircraft, five amateur-radio bands, and TV audio and

Info-Tech's M-44 AMTOR converter.

The PKT-1 packet radio controller from Advanced Electronic Applications.

The Regency Electronics' 20-channel scanner.

FM broadcast. Any frequency can be selected directly at the keypad; each keypress is verified by a beep. A memory-backup system saves frequencies in memory even if power is disconnected, yet no battery is required.

Any frequency can be programmed into priority channel one and sampled at approximately two-second intervals; if active, it automatically overrides any other signal. Any selected channel or channels can be "locked out" and omitted temporarily from the scan. A scan-delay feature can be invoked to avoid missing callbacks; this feature delays resumption of scanning for approximately two seconds after a transmission ends. A choice of two scan speeds samples channels as rapidly as five per second or at a slower rate.

The MX-5000's search feature helps locate unknown or "hidden" channels within any specified frequency range; it searches for active channels in (selectable) 5-, 12.5-, or 25-kHz increments; the mode of reception (AM, wideband or narrowband FM) is also selectable. When a signal is received, its frequency is displayed on the digital readout. Search may then be resumed, or the new frequency stored in one of the 20 scan channels.

The multi-function digital display shows both channel number and frequency (plus MHz or kHz) when scanning (just frequency while searching, plus the receive mode and search frequency increment), and whether the priority mode has been selected or if the displayed channel has been locked out. Error messages are displayed in the event of invalid keyboard entries. A built-in 24-hour digital clock offers the time whenever the MX-5000 is plugged in. The display is side-lighted for easy nighttime legibility.

A slanted front panel offers easy visibility and operation. A keyboard lock switch can disable the keyboard to prevent inadvertent entries. Dual-concentric volume and sqelch controls help tailor the audio delivered to the built-in speaker or external speaker jack. An external antenna jack allows the addition of a full-size antenna for improved reception; an attenuator switch (–10 dB) helps prevent overload from strong local stations in highly congested signal areas.

The MX-5000 comes with a telescoping antenna, wall-mounted ac power supply, a 12-V-dc power cord for use in a car or other vehicle (where not prohibited by law), and mobile-mounting bracket. It measures 5.4"W × 3.1"H × 7.9"D(138 × 80 × 200 mm).

For additional information, contact *Regency Electronics, Inc., 7707 Records St., Indianapolis IN 46226-9989; (317)-545-4281.* Reader Service number 483.

TRAINING TAPES FOR CODE AND THEORY

Radio School, Inc., founded by Gordon West WB6NOA, is offering a large selection of code and theory training tapes to the amateur-radio community. Gordon West has also produced technical tapes dealing with antennas, grounding techniques, and maritime-mobile installation.

Over 700 free volunteer-examiner tape sets were mailed recently to instructors throughout the country, containing FCC-type volunteer-examiner code tests at 5-, 10-, 13-, and 20-word-per-minute levels. There were ten different versions of each tape to prevent students from memorizing them.

Radio School offers over 30 individual one and one-half hour long code cassette speed-building courses. There are also over 20 individual tapes covering theory examination preparation, and 10 tapes dealing with amateur radio equipment installation techniques.

The tape courses are in stereo; students can listen to both channels in the car, but separate the voice channel out when listening to code practice at home with a pencil. Any tape player with a balance control can easily fade out the voice channel. When played on a mono tape recorder, the student will hear both channels.

Radio School was first to offer complete 4-cassette theory courses covering the new FCC questions from Novice to Extra. These theory courses also feature live sounds of amateur radio operating to assist the student in recognizing some of the topics discussed on the tape.

The Gordon West Radio School tapes are available directly from the School. For a catalog or more information, contact *Radio School, 2414 College Drive, Costa Mesa CA 92626.* Reader Service number 477.

THE DAVLE TECH DESOLDERING STATION

The model SA-4 desoldering station from Davle Tech, Inc., features a self-contained high-volume vacuum pump for easy removal of solder from through-hole and multi-layer applications. Additional features include trigger-actuated pistol-grip design, "no-clog" system with transparent solder collector, and easy collector cleaning; grounded for use with delicate MOS and CMOS components, it has a low-maintenance design and a specially-processed long-life nozzle.

The SA-4 is available for either 115-V or 230-V 50/60-Hz input, and is compact and lightweight for portability. A handy tool holder is built into the control unit. Includes .039"(1.0 mm) nozzle. Optional nozzles available from .031"(0.8 mm) to .063"(1.6 mm) diameter.

For more information, contact *Davle Tech Inc., 2-05 Banta Place, Fair Lawn NJ 07410; (201)-796-1720.* Reader Service number 481.

THE VOICE PAK FROM SPECTRUM PROJECTS

Spectrum Projects has introduced a CoCo voice synthesizer, the Voice Pak, that uses the Votrax SC01 synthesizer chip in a cartridge-style pak. It provides an unlimited vocabulary with automatic or user-supplied inflection, a variable voice-level adjustment, plus four programmable levels of pitch. With a single line of code, the Voice Pak adds speech to any Basic program in minutes.

The system comes complete with a user instruction manual, software cassette with demo programs, text-to-speech scanner, and a "Word Manager" that constructs custom user dictionaries. The unit is fully assembled, tested, and ready to plug in and talk. The Voice Pak allows any prompting application in education, speech therapy, games, robotics, or security.

For more information, contact *Spectrum Projects, 93-15 86th Drive, Woodhaven NY 11421; (212)-441-2807.* Reader Service number 482.

ICOM'S MULTIMODE BASE-STATION TRANSCEIVER

Icom announces the IC-471H 430–450-MHz transceiver with 75-Watt transmitter, low-noise PLL circuitry, and high-sensitivity receiver.

Standard features include 75 Watts rf output, FM, SSB, CW modes, 32 full-function tunable memories (storing frequency, offset, offset direction, and tones), 10-Hz tuning increments, 1-MHz up/down buttons, scanning of memories, memory modes, or band, all-mode squelch, and dual vfos. Its size is 4-1/2" (H) × 11-1/2" (W) × 13-1/4" (D).

The IC-471H uses 12-V-dc power and may be supplied from an external source (IC-PS15 or IC-PS30, optional) or from an optional internal ac power supply (IC-PS35). Other optional features include an IC-AG35 switchable mast-mounted preamplifier, UT15S encoder/decoder (PL encoder is standard), IC-CT10 computer interface, IC-EX309 computer-interface connector, and IC-EX310 voice synthesizer.

For more information, contact *Icom America, Inc., 2112 116th Avenue NE, Bellevue WA 98004, (206)-454-8155.* Reader Service number 476.

BV ENGINEERING'S FIRST SOFTWARE

BV Engineering has announced the first three products in what will be an entire line of professional software sharing common data files.

ACNAP is an ac network-analysis program that analyzes electronic circuits consisting of resistors, capacitors, inductors, and active components such as transistors and operational amplifiers. ACNAP will work with component tolerances to perform Monte-Carlo, Sensitivity, and Worst-Case analyses.

PLOTPRO is a general-purpose scientific graph-printing program which makes linear/log/semi-log graphs on any 80- or 132-column printer. PLOTPRO supports vertical and horizontal formats, two Y axes, multiple plots, auto-scaling, labeling, and grid lines.

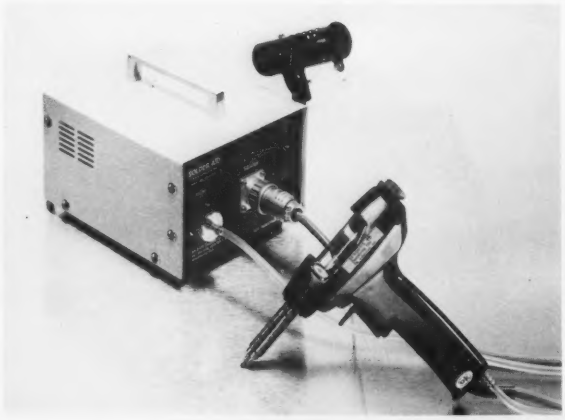
SPP is a general-purpose signal-processing program that analyzes linear and nonlinear systems in the frequency domain and in the time domain. SPP supports FFT and inverse FFT, LaPlace transforms, transient analysis, and a complete set of signal generation and manipulation routines. All programs available for CP/M, MSDOS, PCDOS, and TRSDOS.

For a free flyer and further information, contact *BV Engineering, Box 3429, Riverside CA 92519; (714)-781-0252.* Reader Service number 480.

CMC COMMUNICATIONS VOICE-OPERATED SQELCH

CMC Communications is offering a voice-operated squelch on a small circuit board for mounting inside most HF/SSB transceivers and receivers. The VOS requires that different and select components of the voice spectrum be present at the same time to operate. It ignores heterodynes, the Russian woodpecker, and noise regardless of level, yet it is extremely sensitive to weak signals when the human voice is present. All adjustments are made at the factory and a remote on/off switch is provided. Simple connections are made to the speaker leads and 9 or 12 V dc. This product is used extensively worldwide in commercial marine, land, and military systems.

For further information, contact *CMC Communications, Inc., 5479 Jetport Industrial Blvd., Tampa FL 33614; (813)-885-3996.* Reader Service number 479.



Desoldering station from Davle Tech, Inc.

Icom's multimode base-station transceiver.

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CODE QUICK

Master code or upgrade in a matter of days. **Code Quick** is a unique breakthrough which simplifies learning Morse Code. Instead of a confusing maze of dits and dahs, each letter will magically begin to call out its own name! Stop torturing yourself! Your amazing kit containing 5 power-packed cassettes, visual breakthrough cards and original manual is only **$39.95!** Send check or money order today to WHEELER APPLIED RESEARCH LAB, P.O. Box 3261, City of Industry, CA 91744. Ask for **Code Quick #103,** California residents add 6% sales tax.

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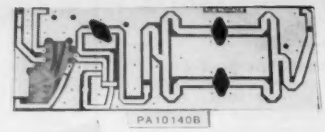

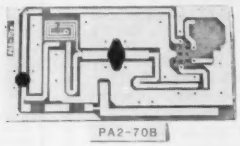

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SD1030-2	12.00	SD1212-12	4.00	SD1380-1	1.00	SD1561	79.00
SD1043	12.00	SD1212-16	4.00	SD1380-3	1.00	SF4557 Mot.	25.00
SD1043-1	10.00	SD1214-7	5.00	SD1380-7	1.00	SK3048 RCA	5.00
SD1045	3.75	SD1214-11	5.00	SD1405	40.00	SK3177 RCA	15.00
SD1049-1	2.00	SD1216	12.00	SD1409	18.00	SMS7714 Mot.	2.50
SD1053	4.00	SD1219-4	15.00	SD1410	22.00	SRF750 Mot.	36.00
SD1065	4.75	SD1219-5	15.00	SD1410-3	21.00	SRF1018 Mot.	5.00
SD1068	15.00	SD1219-8	15.00	SD1413-1	18.00	SRF2147 Mot.	22.00
SD1074-2	18.00	SD1220	8.00	SD1416	50.00	SRF2356 Mot.	38.00
SD1074-4	28.00	SD1220-9	8.00	SD1422-2	24.00	SRF2378 Mot.	16.00
SD1074-5	28.00	SD1222-8	16.00	SD1428	33.00	SRF2584 Mot.	40.00
SD1076	20.00	SD1222-11	7.50	SD1429-2	15.00	SRF2821 Mot.	25.00
SD1077-4	4.00	SD1224-10	18.00	SD1429-3	15.00	SRF2857 Mot.	20.00
SD1077-6	4.00	SD1225	18.00	SD1429-5	15.00	TA8894 RCA	15.00
SD1078-6	24.00	SD1228-8	POR	SD1430	12.00	TIS189/MRF966	3.55
SD1080-8	6.00	SD1229-7	13.00	SD1430-2	18.00	TP312	2.50
SD1080-9	3.00	SD1229-16	13.00	SD1434-5	30.00	TP1014 TRW	5.00
SD1084	8.00	SD1232	4.00	SD1434-9	30.00	TP1028 TRW	15.00
SD1087	15.00	SD1240-8	15.00	SD1438	26.00	01-80703T04/	
SD1089-5	15.00	SD1244-1	14.00	SD1441	91.00	458-949 Mot.Comm.	65.00
SD1095	15.00	SD1262	12.00	SD1442	15.00	TXVF2201 H.P.	450.00
SD1100	5.00	SD1263	15.00	SD1444	6.00	62803 RCA	100.00
SD1109	18.00	SD1263-1	15.00	SD1444-8	6.00	TA7205/2N5921	80.00
SD1115-2	8.00	SD1272	13.00	SD1450-1	28.00	TA7487/2N5920	75.00
SD1115-3	8.00	SD1272-2	15.00	SD1451	18.00	TA7995/2N6267	150.00
SD1115-7	2.50	SD1272-4	15.00	SD1451-2	18.00	SRF2092 Mot.	18.00
SI 1116	5.00	SD1278	20.00	SD1452	20.00	MRF479	8.05
SD1118	22.00	SD1278-1	18.00	SD1452-2	20.00		

We Can Cross Reference Most RF Transistors, Diodes, Hybrid Modules And Any Other Type Of Semiconductor.

* DIODES (HOT CARRIER,MICROWAVE,PIN,SCHOTTKY,TUNNEL,VARACTOR,GUNN) *

1N21	$ 3.40	1N21B	$ 3.40	1N21BR	$ 3.40	1N21C	$ 3.40
1N21D	4.00	1N21DR	4.00	1N21ER	6.00	1N21RF	5.00
1N21WE	5.80	1N21WG	5.80	1N22	5.00	1N23A	10.00
1N23B	3.40	1N23C	3.40	1N23CR	3.40	1N23D	4.95
1N23DR	4.00	1N23WE	5.00	1N25	7.50	1N25AR	18.00
1N28WE	10.00	1N29	10.00	1N32	20.00	1N53A	55.50
1N76	26.00	1N76R	28.00	1N78	26.00	1N78A	20.00
1N78B	26.00	1N78D	28.00	1N78DR	28.00	1N78R	28.00
1N149	6.00	1N150MR	18.00	1N415	4.00	1N415C	4.00
1N415G	15.00	1N416D	5.00	1N416E	6.00	1N446	10.00
1N831	10.00	1N833	10.00	1N950	4.00	1N1084	2.00
1N2930	15.00	1N2932	15.00	1N3540	15.00	1N3712	11.00
1N3713	18.00	1N3714	11.00	1N3715	16.00	1N3716	10.00
1N3717	14.00	1N3718	10.00	1N3721	14.00	1N3733	10.00
1N3747	21.00	1N4386	20.00	1N4396	15.00	1N4785	11.00
1N4812B	9.00	1N5139A/B	4.25	1N5140A/B	4.25	1N5141A/B	4.25
1N5142A/B	4.25	1N5143A/B	4.25	1N5144A/B	4.25	1N5145A/B	4.25
1N5146A/B	4.25	1N5147A/B	4.25	1N5148A/B	4.25	1N5167	5.50
1N5453	3.75	1N5465	7.65	1N5711	1.00	1N5711 JAN	2.00
1N5713	5.00	1N5767	2.00	1N6263	1.00	1S2199	15.00
1S2200	15.00	1S2208/9	1.00	8B1087/48R869558	65.00	8D3020	65.00
A2X116M Aertech	50.00	BB105B	1.00	BB105G	1.00	BD4/4JFBD4 G.E.	15.00
BL161 Bomac	5.00	CMD514AB C.M.	POR	D4060 Alpha	POR	D4159 Alpha	POR
D4233B Alpha	POR	D4900 Alpha	POR	D4959 Alpha	POR	D4987M Alpha	POR
D5047C Alpha	POR	D5147D Alpa	POR	D5503 Alpha	POR	D5506 Alpha	POR
DGB6158-98 Alpha	POR	DMD6022 Alpha	POR	DMD6460A Alpha	POR	DP20054 Crown	POR
GC1691-89 GHZ	31.35	GC1602-89 GHZ	31.35	GC1607-40 GHZ	31.35	GC2531-88 GHZ	37.40
GC2542-46 GHZ	37.40	GC3208-40 GHZ	37.40	GC17044 GHZ	50.00	HP33644A-HD1	125.00
HP5082-0112	14.20	HP5082-0241	75.60	HP5082-0253	105.00	HP5082-0320	58.00
HP5082-0375	POR	HP5082-0386	POR	HP5082-0401	POR	HP5082-0438	POR
HP5082-1028	POR	HP5082-1332	POR	HP5082-2254	POR	HP5082-2302	10.70
HP5082-2303	5.20	HP5082-2696	POR	HP5082-2711	23.15	HP5082-2727	POR
HP5082-2800	1.00	HP5082-2805	4.45	HP5082-2835	1.00	HP5082-2884	POR
HP5082-3039	6.70	HP5082-3040	36.00	HP5082-3080	2.00	HP5082-3188	1.00
HP5082-3379	1.50	HP5082-6459	POR	HP5082-6462	POR	HP5082-6888	POR
HP5082-8016	POR	HP5082-8323	POR	K3A Kemtron	7.00	MA450A	POR
MA475	POR	MA40008	POR	MA41487	POR	MA41765	POR
MA41766	POR	MA43004	48.00	MA43589	POR	MA43622	POR
MA43636	POR	MA45104	27.00	MA47044	POR	MA47051	25.50
MA47100	3.05	MA47202	30.80	MA47771	POR	MA47838*	POR
MA47852	POR	MA49106	37.95	MA49558	POR	MA86731	125.00

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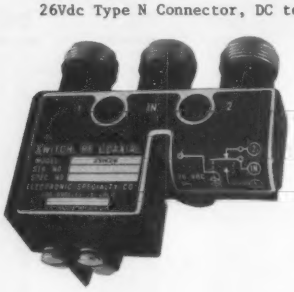
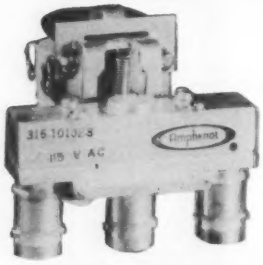
COAXIAL RELAY SWITCHES SPDT

Electronic Specialty Co./Raven Electronics FSN 5985-556-9683 $49.00
Part # 25N28 Part # SU-01
26Vdc Type N Connector, DC to 1 GHz.



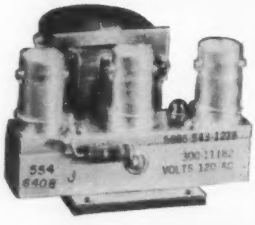
Amphenol
Part # 316-10102-8
115Vac Type BNC DC to 3 GHz.

$29.99



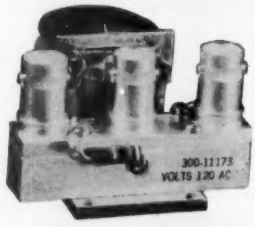
FXR
Part # 300-11182
120Vac Type BNC DC to 4 GHz.
FSN 5985-543-1225

$39.99



FXR
Part # 300-11173
120Vac Type BNC Same
FSN 5985-543-1850

$39.99



BNC To Banana Plug Coax Cable RG-58 36 inch or BNC to N Coax Cable RG-58 36 inch.

$7.99 or 2 For $13.99 or 10 For $50.00 $8.99 or 2 For $15.99 or 10 For $60.00

SOLID STATE RELAYS

P&B Model ECT1DB72 PRICE EACH $5.00	5vdc turn on	120vac contact at 7amps or 20amps on a 10"x 10"x .124 aluminum. Heatsink with silicon grease.
Digisig, Inc. Model ECS-215 PRICE EACH $7.50	5vdc turn on	240vac contact 14amps or 40amps on a 10"x 10"x .124 aluminum. Heatsink with silicon grease.
Grigsby/Barton Model GB7400 PRICE EACH $7.50	5vdc turn on	240vac contact at 15amps or 40amps on a 10"x 10"x .124 aluminum. Heatsink with silicon grease.

NOTE: *** Items may be substituted with other brands or equivalent model numbers. ***

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RECALL PHONE MEMORY TELEPHONE WITH 24 NUMBER AUTO DIALER

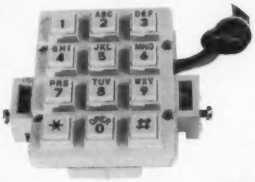
The Recall Phone Telephone employs the latest state of art communications technology.It is a combination telephone and automatic dialer that uses premium-quality,solid-state circuitry to assure high-reliability performance in personal or business applications. $49.99

ARON ALPHA RAPID BONDING GLUE

Super Glue #CE-486 high strength rapid bonding adhesive.Alpha Cyanoacrylate.Set-Time 20 to 40 sec.,0.7fl.oz.(20gm.)
$2.00

TOUCH TONE PAD

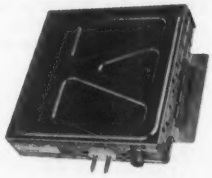
This pad contains all the electronics to produce standard touch-tone tones. New with data.



$9.99 or 10/$89.99

MITSUMI UHF/VHF VARACTOR TUNER MODEL UVE1A

Perfect for those unscrambler projects. New with data.



$19.99 or 10/$149.99

INTEGRATED CIRCUIT.		1 to 10	11up
MC1372P	Color TV Video Modulator Circuit.	$ 4.42	$2.95
MC1358P	IF Amp.,Limiter,FM Detector,Audio Driver,Electronic Attenuator.	5.00	4.00
MC1350P	IF Amplifier	1.50	1.25
MC1330A1P	Low Level Video Detector	1.50	1.15
MC1310P	FM Stereo Demodulator	4.29	3.30
MC1496P	Balanced Modulator/Demodulator	1.50	1.25
LM565N	Phase Locked Loop	2.50	2.00
LM380N14	2Watt Audio Power Amplifier	1.56	1.25
LM1889N	TV Video Modulator	5.00	4.00
NE564N	Phase Locked Loop	10.00	8.00
NE561N	Phase Locked Loop	10.00	8.00

FERRANTI ELECTRONICS AM RADIO RECEIVER MODEL ZN414 INTEGRATED CIRCUIT.

Features:

1.2 to 1.6 volt operating range.,Less than 0.5ma current consumption. 150KHz to 3MHz Frequency range.,Easy to assemble,no alignment necessary. Effective and variable AGC action., Will drive an earphone direct. Excellent audio quality.,Typical power gain of 72dB.,TO-18 package. With data. $2.99 or 10 For $24.99

NI CAD RECHARGEABLE BATTERIES

AA Battery Pack of 6 These are Factory New. $5.00

SUB C Pack of 10 2.5Amp/Hr. $10.00

Gates Rechargeable Battery Packs

12vdc at 2.5Amp/Hr. $11.99
12vdc at 5Amp/Hr. $15.99

MOTOROLA MRF559 RF TRANSISTOR

hfe 30min 90typ 200max.
ft 3000mhz
gain 8db min 9.5typ at 870mhz
13db typ at 512mhz
output power .5watts at 12.5vdc at 870mhz.

$2.05 or 10/$15.00

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"SOCKETS AND CHIMNEYS"

EIMAC TUBE SOCKETS AND CHIMNEYS

		$POR
SK110	Socket	
SK300A	Socket For 4CX5000A,R,J, 4CX10,000D, 4CX15,000A,J	$520.00
SK400	Socket For 4-125A,250A,400A,400C,4PR125A,400A,4-500A,5-500A	260.00
SK406	Chimney For 4-250A,400A,400C,4PR400A	74.00
SK416	Chimney For 3-400Z	36.00
SK500	Socket For 4-1000A/4PR1000A/B	390.00
SK600	Socket For 4CX250B,BC,FG,R,4CX350A,F,FJ	51.00
SK602	Socket For 4CX250B,BC,FG,R,4CX350A,F,FJ	73.00
SK606	Chimney For 4CX250B,BC,FG,R,4CX350A,F,FJ	11.00
SK607	Socket For 4CX600J,JA	60.00
SK610	Socket For 4CX600J,JA	60.00
SK620	Socket For 4CX600J,JA	66.00
SK626	Chimney For 4CX600J,JA	10.00
SK630	Socket For 4CX600J,JA	66.00
SK636B	Chimney For 4CX600J,JA	34.00
SK640	Socket For 4CX600J,JA	36.00
SK646	Chimney For 4CX600J,JA	71.00
SK700	Socket For 4CX300A,Y,4CX125C,F	225.00
SK711A	Socket For 4CX300A,Y,4CX125C,F	225.00
SK740	Socket For 4CX300A,Y,4CX125C,F	86.00
SK770	Socket For 4CX300A,Y,4CX125C,F	86.00
SK800A	Socket For 4CX1000A,4CX1500B	225.00
SK806	Chimney For 4CX1000A,4CX1500B	40.00
SK810	Socket For 4CX1000A,4CX1500B	225.00
SK900	Socket For 4X500A	300.00
SK906	Chimney For 4X500A	57.00
SK1420	Socket For 5CX3000A	650.00
SK1490	Socket For 4CV8000A	585.00

JOHNSON TUBE SOCKETS AND CHIMNEYS

124-111/SK606	Chimney For 4CX250B,BC,FG,R, 4CX350A,F,FJ	$ 10.00
122-0275-001	Socket For 3-500Z, 4-125A, 250A, 400A, 4-500A, 5-500A	(pair)15.00
124-0113-00	Capacitor Ring	15.00
124-116/SK630A	Socket For 4CX250B,BC,FG,R, /4CX350A,F,FJ	55.00
124-115-2/SK620A	Socket For 4CX250B,BC,FG,R, /4CX350A,F,FJ	55.00
	813 Tube Socket	20.00

TUBE CAPS (Plate)

HR1, 4	$11.00
HR2,3, 6 & 7	13.00
HR5, 8	14.00
HR9	17.00
HR10	20.00

CHIP CAPACITORS

.8pf	10pf	100pf*	430pf
1pf	12pf	110pf	470pf
1.1pf	15pf	120pf	510pf
1.4pf	18pf	130pf	560pf
1.5pf	20pf	150pf	620pf
1.8pf	22pf	160pf	680pf
2.2pf	24pf	180pf	820pf
2.7pf	27pf	200pf	1000pf/.001uf*
3.3pf	33pf	220pf*	1800pf/.0018uf
3.6pf	39pf	240pf	2700pf/.0027uf
3.9pf	47pf	270pf	10,000pf/.01uf
4.7pf	51pf	300pf	12,000pf/.012uf
5.6pf	56pf	330pf	15,000pf/.015uf
6.8pf	68pf	360pf	18,000pf/.018uf
8.2pf	82pf	390pf	

PRICES: 1 to 10 - .99¢ 101 to 1000 .60¢ * IS A SPECIAL PRICE: 10 for $7.50
11 to 50 - .90¢ 1001 & UP .35¢ 100 for $65.00
51 to 100 - .80¢ 1000 for $350.00

WATKINS JOHNSON WJ-V907: Voltage Controlled Microwave Oscillator $110.00

Frequency range 3.6 to 4.2GHz, Power ouput, Min. 10dBm typical, 8dBm Guaranteed. Spurious output suppression Harmonic (nf_0), min. 20dB typical, In-Band Non-Harmonic, min. 60dB typical, Residual FM, pk to pk, Max. 5KHz, pushing factor, Max. 8KHz/V, Pulling figure (1.5:1 VSWR), Max. 60MHz, Tuning voltage range +1 to +15volts, Tuning current, Max. -0.1mA, modulation sensitivity range, Max. 120 to 30MHz/V, Input capacitance, Max. 100pf, Oscillator Bias +15 +-0.05 volts @ 55mA, Max.

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TUBES

TYPE	PRICE	TYPE	PRICE	TYPE	PRICE
2C39/7289	$ 34.00	1182/4600A	$500.00	ML7815AL	$ 60.00
2E26	7.95	4600A	500.00	7843	107.00
2K28	200.00	4624	310.00	7854	130.00
3-500Z	102.00	4657	84.00	ML7855KAL	125.00
3-1000Z/8164	400.00	4662	100.00	7984	14.95
3B28/866A	9.50	4665	500.00	8072	84.00
3CX400U7/8961	255.00	4687	P.O.R.	8106	5.00
3CX1000A7/8283	526.00	5675	42.00	8117A	225.00
3CX3000F1/8239	567.00	5721	250.00	8121	110.00
3CW30000H7	1700.00	5768	125.00	8122	110.00
3X2500A3	473.00	5819	119.00	8134	470.00
3X3000F1	567.00	5836	232.50	8156	12.00
4-65A/8165	69.00	5837	232.50	8233	60.00
4-125A/4D21	79.00	5861	140.00	8236	35.00
4-250A/5D22	98.00	5867A	185.00	8295/PL172	500.00
4-400A/8438	98.00	5868/AX9902	270.00	8458	35.00
4-400B/7527	110.00	5876/A	42.00	8462	130.00
4-400C/6775	110.00	5881/6L6	8.00	8505A	95.00
4-1000A/8166	444.00	5893	60.00	8533W	136.00
4CX250B/7203	54.00	5894/A	54.00	8560/A	75.00
4CX250FG/8621	75.00	5894B/8737	54.00	8560AS	100.00
4CX250K/8245	125.00	5946	395.00	8608	38.00
4CX250R/7580W	90.00	6083/AZ9909	95.00	8624	100.00
4CX300A/8167	170.00	6146/6146A	8.50	8637	70.00
4CX350A/8321	110.00	6146B/8298	10.50	8643	83.00
4CX350F/8322	115.00	6146W/7212	17.95	8647	168.00
4CX350FJ/8904	140.00	6156	110.00	8683	95.00
4CX600J/8809	835.00	6159	13.85	8877	465.00
4CX1000A/8168	242.50*	6159B	23.50	8908	13.00
4CX1000A/8168	485.00	6161	325.00	8950	13.00
4CX1500B/8660	555.00	6280	42.50	8930	137.00
4CX5000A/8170	1100.00	6291	180.00	6L6 Metal	25.00
4CX10000D/8171	1255.00	6293	24.00	6L6GC	5.03
4CX15000A/8281	1500.00	6326	P.O.R.	6CA7/EL34	5.38
4CW800F	710.00	6360/A	5.75	6CL6	3.50
4D32	240.00	6399	540.00	6DJ8	2.50
4E27A/5-125B	240.00	6550A	10.00	6DQ5	6.58
4PR60A	200.00	6883B/8032A/8552	10.00	6GF5	5.85
4PR60B	345.00	6897	160.00	6GJ5A	6.20
4PR65A/8187	175.00	6907	79.00	6GK6	6.00
4PR1000A/8189	590.00	6922/6DJ8	5.00	6HB5	6.00
4X150A/7034	60.00	6939	22.00	6HF5	8.73
4X150D/7609	95.00	7094	250.00	6JG6A	6.28
4X250B	45.00	7117	38.50	6JM6	6.00
4X250F	45.00	7203	P.O.R.	6JN6	6.00
4X500A	412.00	7211	100.00	6JS6C	7.25
5CX1500A	660.00	7213	300.00*	6KN6	5.05
KT88	27.50	7214	300.00*	6KD6	8.25
416B	45.00	7271	135.00	6LF6	7.00
416C	62.50	7289/2C39	34.00	6LQ6 G.E.	7.00
572B/T160L	49.95	7325	P.O.R.	6LQ6/6MJ6 Sylvania	9.00
592/3-200A3	211.00	7360	13.50	6ME6	8.90
807	8.50	7377	85.00	12AT7	3.50
811A	15.00	7408	2.50	12AX7	3.00
812A	29.00	7609	95.00	12BY7	5.00
813	50.00	7735	36.00	12JB6A	6.50

NOTE * = USED TUBE

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BAKER AND HOWLAND: ANOTHER NEW ONE

Another new country will soon be added to the ARRL DXCC Countries List: Baker and Howland Islands, located in the middle of the Pacific Ocean. Let's look at the process whereby new countries are added to the DXCC list by following the saga of the latest country on that list.

As with many "new ones" in modern DX history, the new country of Baker and Howland Islands rises out of the ashes of a former DXCC country which will be deleted from the DXCC roles when Baker and Howland is added. The old DXCC country of Baker, Howland, and the American Phoenix Islands will no longer exist, and future contacts with amateurs in that region will count for other DXCC countries.

The Baker-Howland story begins in the 19th century when Great Britain claimed the Line Islands and the Phoenix group. These are widely-separated, small coral atolls near the equator, south and southwest of Hawaii. The total land area in this region is less than 20 square miles. The atolls were known primarily for their extensive bird populations, which produced what was the chief export of the islands in the 19th century, bird guano.

Great Britain was not the only country to take an interest in these islands. The United States claimed the islands by right of discovery, and even issued some mining permits to guano collectors. From 1937 on, some US personnel lived permanently on Canton, an island in the Phoenix group.

In 1939, Great Britain and the United States sat down to resolve their differences in this area. Neither country was willing to give up its claim to the islands of the region, so a compromise was reached whereby *both* countries would administer the birds and their nests. This joint administration recognized the claims of both countries. Since the bottom had fallen out of the guano market, no one seemed particularly interested in the area.

Our little disagreement with Japan (i.e., WWII) changed that, and the US built and maintained a major military base on the largest island of the region (and the largest coral atoll in the world), Christmas Island. The joint administration of some of the islands in the Phoenix group continued until 1970, when the US Air Force took over control of Canton Island (where it had a military base). But the agreement with the British continued.

So matters stood until 1979, when the Republic of Kiribati was born. Kiribati stretches several thousand miles across the central Pacific from the Gilbert Islands in the West to the Line Islands far to the east. With this change, the British relinquished their claim to the islands in the area and gave their portion of control to the new Kiribati Republic.

Meanwhile, the joint administration of Canton Island in the heart of the Phoenix group created an interesting amateur-radio situation. A ham station on Canton could operate under US rules with a KH1 callsign (formerly KB6 before the FCC started messing around with callsigns), or that same station, in the same location, could operate under British control with a VR1 call.

There are very few spots in the world which count for more than one DXCC country at one time. (A Peace Park on the border between Norway and Sweden is the only other which comes to mind. Anyone know of any others?) A ham on Canton could hand out a DXCC contact for the British Phoenix Islands, and then, by switching calls, could hand out a QSO good for the American Phoenix DXCC credit.

The independence of the Kiribati Republic didn't change the basic nature of this amateur-radio anomaly; only the callsigns changed. The Kiribati Republic began issuing T3 calls, including T31 calls for the Central Kiribati Republic (the Phoenix Island group). Contacts from Canton Island could still count for either the American Phoenix DXCC credit or for Central Kiribati T31.

Eric Sjoland SM0AGD operated from Canton a couple of years ago and helped knock both KH1 and T31 off the Most Wanted List. Eric operated under his KH1 call one day, and then switched over to his T31 call the next.

Meanwhile, even while Eric was making thousands of DX QSOs from Canton, the Northern California DX Foundation was laying the groundwork for a new DXCC country.

Soon after the Kiribati Republic was created, the United States signed a Treaty Of Friendship with the new country. In this treaty, the US renounced its claim to the islands in the Phoenix group, including Canton. The Air Force had decided that it no longer needed its Canton base, and therefore closed the base at about the same time.

The workings of the US government are slow, and it was almost four years before this treaty was ratified by the Senate. Once President Reagan signs the treaty, the US no longer has any territorial claim to the islands and loses the right to issue amateur-radio licenses for the region.

The amateur-radio implications of the treaty go beyond callsigns. The US is retaining its claim to the tiny islands of Baker and Howland, just north of the central Kiribati Islands. These two islands were never under joint administration, nor were they part of the Republic of Kiribati.

But the DXCC country is defined as Baker, Howland, and the American Phoenix Islands, including Canton. When the treaty is signed, Canton (and the other American Phoenix Islands) will no longer be under US jurisdiction. So the majority of the present DXCC country will vanish.

Members of the Northern California DX Foundation recognized that the old DXCC country could not continue unchanged. As they saw the situation, the old country of Baker, Howland, and the American Phoenix Islands should have been deleted from the DXCC list when the American Phoenix Islands reverted to sole ownership by the Kiribati Republic. Further, the islands of Baker and Howland, now cast off from the larger, populated Phoenix Islands, were a prime candidate to become a new DXCC country.

The NCDXF carefully assembled the documents detailing the administrative changes in the region and submitted a request to the ARRL DX Advisory Committee to delete the old DXCC country of Baker, Howland, and American Phoenix and add a new country of Baker and Howland Islands.

The carefully-reasoned and well-written submission to the DX Advisory Committee argued that with the loss of the American Phoenix Islands from the old DXCC country, that country should cease to exist. To support their request, the NCDXF cited several precedents in DXCC history in which DXCC countries losing much of their territory have been deleted from the DXCC list. These favorable precedents included the deletion of Germany and the establishment of two separate countries of East and West Germany. The NCDXF also cited previous deletions in the 1960s in Africa (as the French colonial holdings became independent).

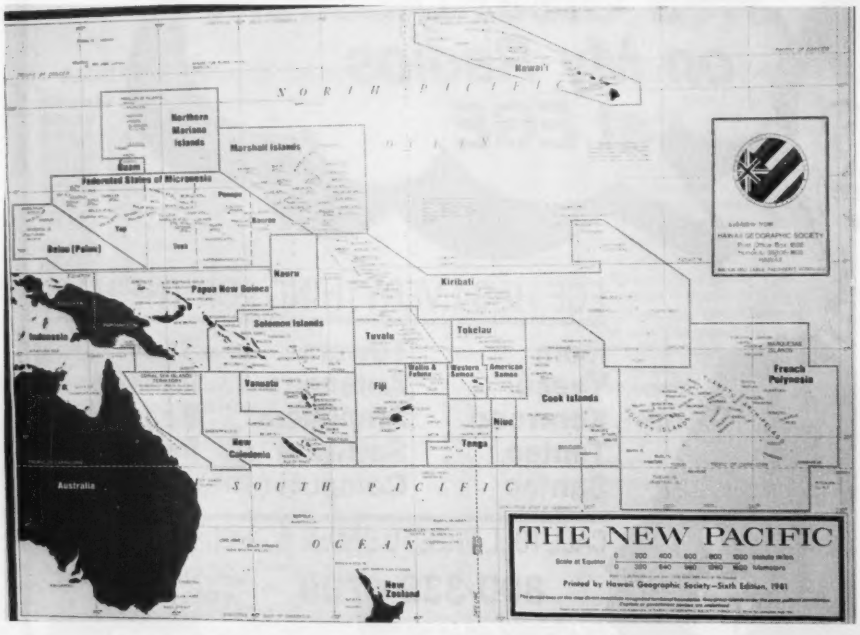
Of course, the DXCC program is not known for its consistency. The DXCC list is full of conflicting precedents. There were several cases in which DXCC countries lost significant portions of their land area and were not deleted from the DXCC list.

The NCDXF bolstered their argument with detailed land-area charts, supporting their claim that the DXCC country would lose 90% of its land area and 100% of its human population when the US gave up its control of the Phoenix group.

The argument proved telling, as, in late spring of this year, the DX Advisory Committee supported the NCDXF request. The ARRL Awards Committee will most likely approve this recommendation, and another DXCC country will join the ranks of the deleted.

Concurrent with this deletion is the recommendation to create a new DXCC country of Baker and Howland Islands. After all, these islands would no longer be part of the now-deleted country. On the other hand, the islands are too far from any other US island in the region to be part of a previously-existing DXCC country. The only option left is to establish a new one composed of the two islands, and such was the recommendation of the DXAC.

The tiny islands join several other minute and difficult-to-reach US possessions in the region. Just north of Christmas Island (in the Eastern Kiribati Republic) are the islands of Palmyra and Kingman Reef, both of which are separate DXCC countries. The difficulty and expense of reaching these isolated islands has kept them high on the Most Wanted List. And an unfortunate crash landing of a DXpedition airplane on Palmyra has caused the owners of the island to stop issuing landing permission for DXpeditioners to the island. Tiny Kingman Reef is only a



Baker and Howland Islands are located directly above the word "Kiribati" in this photo.

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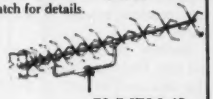

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few feet above the waves and therefore requires a major expedition and good weather for a significant radio operation. Hence, Kingman Reef and Palmyra are among the more difficult countries to work in the Pacific.

Baker and Howland will certainly fall into this category. The islands are now a wildlife refuge under the control of a Department of Interior unit. In addition to the usual problems of transportation, generators, gear, food, and shelter, any DXpedition to the new country of Baker and Howland will have to comply with the requirements of the Interior Department not to disturb the wildlife.

The NCDXF hopes to mount the first DXpedition to this new country sometime in the near future. Given the transportation problems in the area, the DXpedition will be a major one. There are no scheduled air flights in the area except to Christmas Island (well over a thousand miles away). Even locating Howland will be a challenge, as the island is surrounded by more than 300 miles of open ocean.

One well-known individual had trouble doing just that. It was Howland Island that Amelia Earhart was attempting to locate on the last, and fatal, leg of her round-the-world flight. The last the world heard of this intrepid aviatrix was a garbled radio transmission in the vicinity of Howland, and then silence. Hopefully, the NCDXF team will have better luck finding their destination.

So the next time you hear a station from KH1, the odds are you haven't worked it before. Jump into the pileup and be one of the fortunate amateurs who works a new one on the first operation from KH1. Special thanks to Jim Maxwell W6CF, secretary of the Northern California DX Foundation, for this information.

RTTY LOOP

Marc I. Leavey, M.D. WA3AJR
6 Jenny Lane
Pikesville MD 21208

Labor Day finds us looking forward to the kids returning to school, the new fall television season, and cooler weather to work on that new antenna system. Nonetheless, many of you have offered this thought or that on your own RTTY setup. Let's see what's going on.

SSG Gary Kohtala DA2XF is using a Commodore 64 and is interested in RTTY mailboxes. He questions whether the Apple program, Super-RATT, published by Universal Software Systems, is available. Apparently he has tried to contact USS without results. Well, sorry to say, Gary, I have not seen any ads from the firm in several months. I just don't know their condition. If anyone can help Gary out, drop me a line and I will forward the information to him.

One ham who is operating a Commodore computer as a RTTY mailbox is Bob Kling K8GJL. He notes that several amateurs are operating through the 146.25/146.85 repeater in Vandalia, Ohio. While usual operations are at 60 wpm Murray, ASCII is in use at 110 baud for program transfer. Bob would like to see listings of other RTTY mailboxes in this column. So would I, Bob, but few of the system operators have sent data to me here at WA3AJR. I promise to publish all the listing and operating information I receive; just send it to me at the above address and watch for it about three or four months later in this column.

By the way, Bob, you mention in your letter that the program you are running is in Basic. How about sending along a copy and we will run it for other VIC-20 users to implement at their stations? It might even be adapted easily to other small computers. Let me hear from you.

One reader who indicates his interest in the VIC-20 on RTTY is Thomas Zeltwanger KG3V. Tom states that he has several programs available at nominal cost to run RTTY on the VIC-20. Interested amateurs should write Tom at PO Box 62, State College PA 16804, enclosing an SASE and indicating they desire information on the VIC-20 programs mentioned in "RTTY Loop."

Jim MacMurray KA2DWH is the first to write me asking about using the new Micro-CoCo (Radio Shack MC-10) computer on RTTY. This computer uses the 6803 CPU, which is an intermediate between the older 6800 and the advanced 6809 which runs the "standard" Color Computer™ (TRS-80C). I would think, offhand, that any of the older 6800 programs published here in the past would run if the ROM calls were changed to use analogous routines in the system monitor ROM. I have scanned several of the specialty magazines such as *HOT CoCo* and not found anything specific to the MC-10. If any readers have interfaced their Micro-CoCo to RTTY, let us all know about it.

One of our regular fans, Earl Morris N8ERO, passes along two points. First of all, his first name was misspelled in an earlier column; sorry about that Earl. With my name spelled as unusually as it is, I am rather sensitive to that and try to keep the spelling straight. Earl's question relates to the several types of ASCII that are sent on various circuits. He asks if data bits should number seven or eight, one or two stop bits, parity or not parity, or just what is the standard?

Well, if telephone bulletin boards are any example, there just isn't any. There are some points to be made in favor of each choice; let me tell you mine. Let's deal with parity first—most terminals ignore it. Therefore, so should you. Now, I know that parity checking is very useful, and I do use it myself on noisy lines, but if you have to deal with the great variety of terminals out there, ranging from mechanical Teletype™ machines to whiz-bang video terminals, the only practical solution is not to require parity.

Similarly, the pure ASCII code is seven, not eight bits, and unless you are transmitting data such as with an XMODEM-type transfer or graphics, seven data bits should be enough.

Now, as far as stop bits go, you should have two different schemes. When transmitting, send with two stops; when receiving, require only one. That way minor differences in speed, entirely possible with the variety of terminal programs in use, will have a bit of slack in the receiver. This was one feature of an old computer tape-storage scheme pioneering by W2NSD, and I still think it has merit. Those are my thoughts, let me hear all of yours.

I have received several letters asking for a simple AFSK generator. Fig. 1 is one such design which I have seen in various forms over the past few years. This one is adapted from an article by Clay Abrams K6AEP in the September, 1983, issue of *73*, on a RTTY program for the CoCo.

As the circuit accepts input using the RS-232 standard, let me say a few words about that. The RS-232 standard sets up many parameters for a digital signal that will be used to transmit information. Although there is much more to be specified than this, all we are going to concern ourselves with here are the voltage levels and polarities that define Mark and Space. The Mark signal shall be a negative voltage, less than −3 volts, and the Space shall be a positive voltage, greater than +3 volts.

To clarify that, with common transistor-transistor logic devices (TTL), a Mark signal is normally +Vcc, nominally +5 volts, and a Space is at ground potential, or 0 volts. With an RS-232 signal, this positive-negative relationship is reversed and the Mark is the negative signal, while the Space is the positive.

Now, I use three volts as the level, which is oversimplifying a great deal. The actual level can vary within a window from around two volts to about twelve volts. In practice, plus and minus five to eight volts should be adequate. This simple design with one chip and a few external components should be enough to put you on RTTY in a short while.

I am pleased to announce this month, the availability of the fourth in our series of RTTY reprints. For those who came in late, these are rewrites of material published in the early years of "RTTY Loop" on basic RTTY concepts. They have been condensed where need be and expanded in other areas, and are available from this address at $2.00 per issue, and an SASE. If you would like a list of topics published so far, just send an SASE to me and I will be happy to send that out. Feel free to include other comments or topics for the column with your requests; I read them all and am always delighted to hear from you.

While I'm at it, I appreciate some of the general comments offered by Bill Spann, in Mooresville, Indiana, Edward Radtke WA4BQE, in Louisville, Kentucky, George A. Collier, Jr. W5GME, in Durant, Oklahoma, Bill Pascale W6JED, in Oroville, California, Thomas Page, DDS WB7WQI, in Salt Lake City, Utah, and the many others who send me general comments, questions, and jabs which keep my keyboard popping. As I said a while back, I try to answer all mail received as soon as I can. All you need to do is enclose an SASE or sufficient US funds or IRCs for foreign countries, and send the letter to me at the address at the top of this column. While I don't publish all the questions received, I will try at least to acknowledge you in print. Of course, because of the lead time of the column, you should receive your reply before you see your name here!

In response to the clamoring for more photos from the WA3AJR camera, here is another of the sights from the 1984 Baltimore Amateur Radio Club Hamboree and Computerfest. One of the most anachronistic tables I saw was offering two items: eight-inch disk drives, and cloth ribbons for a Model 15 Teletype. The old and the new, in juxtaposition and harmony. Isn't that what RTTY really is, though? I think so, and so will you, as you continue to follow the latest here, in "RTTY Loop."

An anachronistic offering.

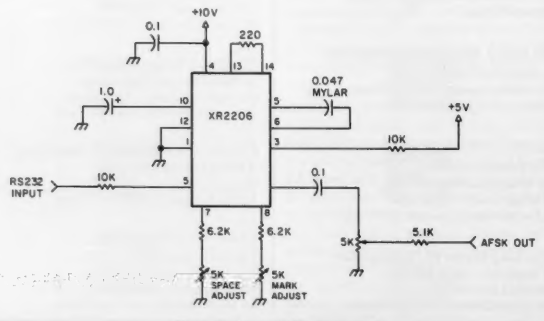

Fig. 1. A simple AFSK generator.

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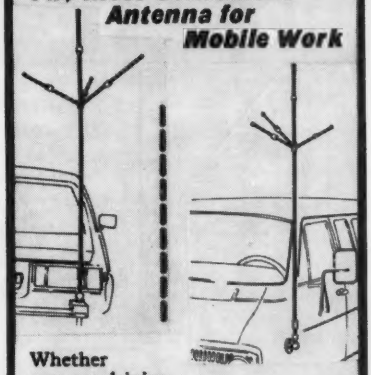

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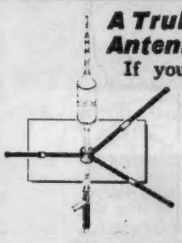

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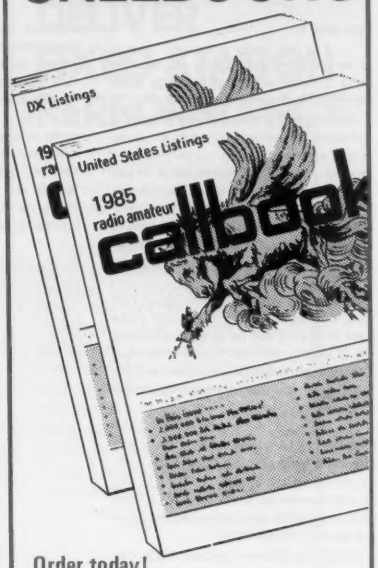

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73 INTERNATIONAL

from page 60

is an excellent opportunity for amateur radio to obtain some free publicity, albeit restricted for the present.

One of the alternative program items at the recent conference attracted an unusual and varied following. Jazzercise, your reporter observed, attracted about 14 participants, including an attractive demonstrator, as well as about 50 "lookers" observing the merits, etc., of this type of exercise activity. I'm not too sure whether the lookers were observing "how" or "wow!"

In the Hidden Tx Hunt (Fox Hunt) contest, won by ZL3TLB's team, 3rd place went to one of our paraplegic amateurs, Bill ZL2BMQ, and his "pusher," George. As all the other competitors were on foot, Bill felt he was slightly advantaged because he was "mobile."

One of the 20 teams entered in the Mobile Rally, ZL2AA, the Gisborne team, had the only mobile antenna farm in the rally, supported by a mini-bus; the vehicle had at least a dozen aerials on or around it and I'm told the extra drag increased the gasoline account considerably.

WARO, the Women Amateur Radio Operators Club, elected Jeanne ZL2BOD of Hawera as their president for the ensuing year. There were about 35 WARO members at the annual general meeting on Sunday morning.

The Amateur Radio Emergency Corps (AREC) annual general meeting was attended by between 60 and 70 members, and various items were discussed including the Civil Defense Communications systems which are in the process of changes, as and when finances and equipment become available.

The AMSAT session included talks by Jim KA7APJ, Ian ZL1AOX, and others, giving very interesting accounts of AMSAT activities, as well as showing videos of some AMSAT happenings. There was also a video of the "Amateur in Space" showing continuously during the breaks in the conference sessions, and this attracted large crowds at every showing.

The VHF Forum chaired by Vaughan ZL1TGC and Jamie ZL2PU attracted about 90 interested members, and the subjects discussed ranged from repeater uses and abuses to packet radio. The VHF scene in ZL is very much alive and has a very good following, particularly amongst the younger and extremely talented, technically-inclined amateurs. Some of the technical features these amateurs are including in their work and projects make an old-timer's mind like mine boggle.

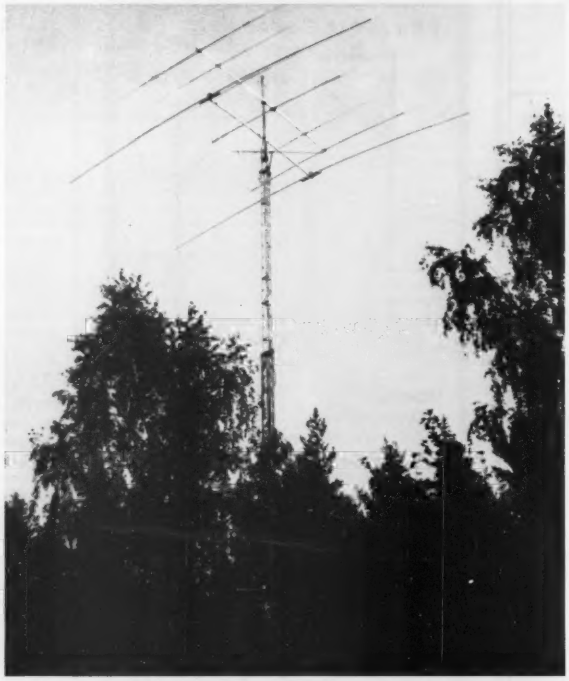
The Old-Timers Club (Quarter Century Club) also held its annual meeting on Sunday morning; about 30 members attended to discuss the business of the club. During the past year, three members received their 60-year certificates, and 33 members gained their 50-year certificates. These certificates are issued by the OTC for being licensed for the period concerned.

On the other side of the ledger, there were 15 Silent Keys recorded in the annual report; the OTC has a total membership throughout ZL of 460 as of the date of the annual meeting.

The Mobile Rally attracted entries from 20 teams and created the usual interesting and amusing incidents. All teams completed the course in good time although several got lost here and there. One team resorted to asking a policeman for directions, only to receive a very facetious reply, the officer of the law being more interested in the strange vehicle with several aerials attached thereto. The rally was conducted on three frequencies, 80, 40, and 2 meters, and consisted of three parts, operating, navigating the course against the clock with check points, and spotting detailed things from the clues given in the instruction sheet. Space does not permit listing the results, but the event was extremely successful, and I'm told there were no strained relations between team members and/or XYLs/YLs as a result of those differences of opinion which do inevitably occur on mobile rallies.

AN E-M-E FIRST

On February 18, a first for ZL was achieved when Graeme ZL3AAD, Christchurch, and John ZL2AQE, Wellington, made the first 432-MHz internal random Earth-Moon-Earth QSO. This contact was not prearranged as many E-M-E QSOs are. Graeme was using his 6-meter dish and John an array of 8 yagis. The straight-line distance between Christchurch and Wellington would be about 300 miles.



Antennas rising from the forest at LA7ZO's log cabin QTH.

Tore LA7ZO at his home QTH.

NORWAY

Bjorn-Hugo Ark LA5YJ
N-3120 Andebu
Norway

Well here we go again, folks. I'm sincerely sorry for not being able to supply any columns for a while, but this is because of illness, so you must forgive me.

Since my last, there has been quite some activity, DX-wise, and for me, the opportunity to work Kermadec Island was surely top drawer. This expedition went smoothly, as always. These guys surely do know how to handle a pileup. They proved that years ago. They are so professional that they should not be doing anything else besides giving us "New Ones." Let that be the honorable praise due them!

If the DXpedition to Kermadec was the high point, the opposite was when the news reached us that the Clipperton team was not able to go because of some unfortunate circumstances. We sincerely hope they will be able to do it again in a not too far off future.

What will I do when I've worked them all? Isn't it great to have something to look forward to!

This time I would like to present to you another friend of mine, Tore Egeberg LA7ZO. Tore has just made it into his 61st year, and is newly retired from his occupation as a 1st officer in the Scandinavian Airlines. His home QTH is situated near the Oslo fiord, around 15 miles south of Oslo. But his main operation point is at his very cozy log cabin near the lake of Kroederen, 13 miles NNW of Oslo. Facing the large lake, it is no wonder that his other hobby must be fishing. He just loves it, and rumors say he loves that more than DXing.

Tore was first licensed in 1971 and has ever since been very interested in DX. His standing in DXCC is 307 phone as of February 1, 1984. He also earned the 5-band DXCC, and was no. 4 in Norway to receive 5-band WAZ.

His home QTH, a two-story house on a 1/4-acre lot, is situated at an altitude of 100 meters topped with a 20-meter tower, a TH6DXX, and a 40/80-meter delta loop. His main operating QTH, the small log cabin, at an altitude of 160 meters, looks rather tiny beside the 30-meter crank-up tower keeping another TH6DXX and a Mosley 2-element yagi for 40 meters. Guy wires are, of course, antennas. Two slopers for 80 meters are giving him a tremendous signal on that band as well. He does, of course, have an additional spare antenna, an 18AVT with a lot of radials, and the tower also supports an inverted-V for 80 meters, up 23 meters for local (European) QSOs only. At home he's running a Yaesu FT-980 and a Drake TR7-line, and an SB-200 linear. At his cabin he has a Yaesu FT-902DM, a Swan 500 as backup, and an NCL-2000 linear. No wonder you hear him booming through the pileups.

Unfortunately, right behind his cabin a mountain rises up to 600 meters, and that direction is his very weakest point. At least there you can beat him in the pileups! But the combination of the two QTHs gives him the most out of everything, so he has, as you can see, really made his callsign heard a few times from both places.

Tore is one of those guys who fixes everything himself, and he seems to be very occupied at this time by restoring old

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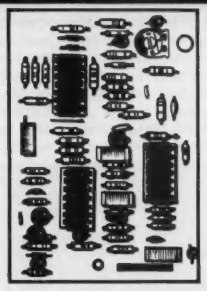

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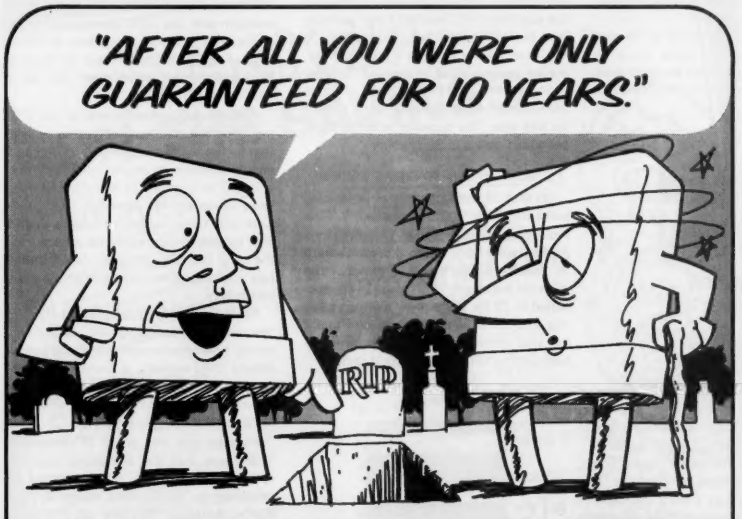

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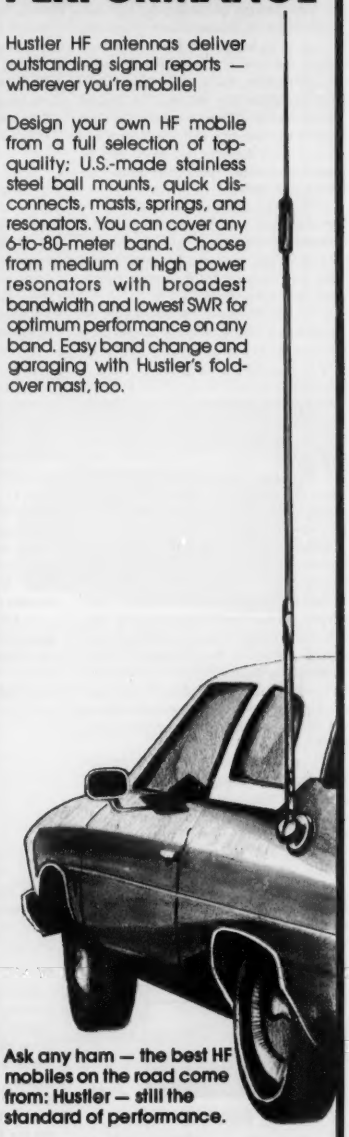

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cars and (of course) repairing the six he has at the moment. I'm sure Tore won't be out of work even if retired. He really knows how to keep himself occupied.

You certainly will hear him on 80 or 40 meters as he loves to work DX on those bands. I'm quite sure he won't say no to a little rag-chew as well. Give him a call when you hear him.

DX

Yes, there is something going on in Norway, but at this time we will not do anything more than quote to you the official bulletin from the 3Y Project 1984/85, administered by the LA-DX Group.

DXpedition to Bouvet Island. There may or may not be experienced radio amateurs among the crew of the Norwegian scientific expedition due to start from South America before the end of 1984. Bouvet will be the last stop after approximately 2 months en route, late in the season. A landing of short duration (1–3 days) may be expected. Amateur radio operation cannot be guaranteed.

Other transportation alternatives or combinations that would be suitable for a DXpedition are being explored by the 3Y-Project set up by the LA-DX Group in 1983, with Jorgen LA5UF as project manager, assisted by Einar LA1EE.

If suitable means of transportation are found, it will be the objective of this project to organize a DXpedition to Bouvet Island in January/February, 1985.

LA-DX Group would like to get in touch with persons, organizations, or companies that can contribute to a solution of the transportation problem—a ship with helicopter(s).

It would also be helpful to know in advance of contributions, if any, in funds or in kind that may be counted on for a DXpedition of this nature.

Write: 3Y-Project Manager Jorgen Hoel, Munkerud asen 12E, 1165 Oslo 11, Norway.

The reason for this press release is that several persons have been passing fake information about where to send contributions or donations, and to once and for all establish the facts. The LA-DX Group has been working on this project for more than a year, and it is recognized officially by the NRRL and other official departments in Norway.

If you should feel that you could perhaps be helpful to the project in any way, please do not hesitate to contact the above address or, if you prefer, me. I would be more than happy to pass the information over to the project manager, LA5UF.

We know that there are many who are needing Bouvet Island, and the efforts put into this project are absolutely serious. I will, of course, keep you informed without delay if anything new should occur.

POLAND

Jerzy Szymczak
78-200 Bialogard
Buczka 2/3
Poland

NEW CENTER OF SCOUT COMMUNICATION

Polish hams in scout uniforms enriched themselves with a new Communication Center in Losice, Miedzyrzecka 59. The Center consists of four buildings. The main building is in a reconditioned mill building. There are some schoolrooms, workshops, storerooms for measuring instruments and radio equipment, a sending/receiving center, and administration rooms. Two warehouses in Losice make it possible to store reserves.

The Center's school together with its library and radio station is in Nowosielec nearby. The carefully-repaired building rises on a little elevation. In summer, instruction camp tents can be raised all around the building. Equipment is available for 80 scouts. In the near future, two 30m masts of rotary antennas will be mounted close by. An emergency power supply makes operation of the radio stations independent. Amateur high-performance SW and USW radio stations can be installed.

What will the Center do in the future? Being well fitted out with modern measuring apparatus, the Center would provide telecommunication equipment for the Polish Scouts' Association (PSA) and prepare materials for training.

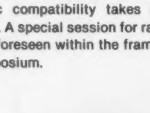
★ ★ ★ ★ ★

The presidium of PRAA (Polish Radio Amateurs Association) is preparing documents for the National Congress, delayed to the second half of 1984 because of the extending of licensing updating by State Radio Surveillance. At the last sitting of the presidium, new instructions of materials management and rules for development funds were accepted.

From January 14 to 17, 1984, the time-honored contest, "Warsaw Marathon," took place to commemorate the 39th anniversary of the Warsaw liberation. Three hundred radio amateurs all over Poland took part in the contest.

The main Inspectorate of State Radio Surveillance was informed of the resolution of WARC to render accessible to hams 10-, 18-, and 24-MHz bands, under permission of country administration. These bands, however, will not be accessible to Polish hams at present, State Radio Surveillance says. At first, we shall be able to work on 10 MHz.

In June, 1984, a symposium on electromagnetic compatibility takes place in Wroclaw. A special session for radio amateurs is foreseen within the framework of the symposium.



SWEDEN

Rune Wande SM0COP
Frejavagen 10
S-155 00 Nykvarn
Sweden

FALU RADIOKLUBB ANNIVERSARY

The oldest still-active radio club in Sweden is located in the capital city of the district called Dalecarlia. The city Falun is primarily known for its copper mines. The Falun mine is older than the Kingdom of Sweden, but the copper mining company received its first known official charter from King Magnus Eriksson in 1347. During the 17th century, the Falun mine was the world's largest producer of copper. No mining is done there any longer, but visitors can tour the mine down to the 180-foot level.

Falu Radioklubb was founded on February 15, 1924, but had actually functioned as a radio-listener's club a year earlier. One of the members, Ove Mogensen, was already then experimenting with transmissions. The purpose of the club was to start regular broadcast transmissions and it was issued the call letters SMZK. This activity was financed mainly through private support but occasionally paid commercials were aired.

Sweden no longer has any privately run broadcast stations due to the state-owned monopoly broadcast radio. In 1950, Falu Radioklubb changed its activities into SWL and amateur radio. The club has twice hosted the annual ham convention for the national league, SSA. The first time was in 1960, the second time this year of the sixtieth anniversary for the club. In fact, Falu Radioklubb is one year older than SSA!

FALUN COPPER COIN AWARD

The club issues a beautiful award. It is a replica of the "one dollar copper coin" from King Karl XII's 18th century. In order to acquire this unusual award, you should contact radio amateurs within the county of Falun. All QSOs have to be made in the same mode, i.e., either CW or phone, not mixed. The minimum report accepted in the exchange is RST 338 on CW and RS 33 on Phone. For stations in Zones 14, 15, 16, and 20, each QSO gives one point. All others receive 5 points for a QSO on 80 meters, 3 points on 40 meters, and 2 points per QSO on 20, 15, and 10 meters. You can count the same station once per band, and the contacts have to be verified by QSL card. However, do not send any cards with the application, just a regular GCR listing. A total of ten (10) points is required for this award. Send the application and the GCR listing to Falu Radioklubb, PO Box 701, S-791 29 Falun, Sweden. The fee is US$15.00.

7SK4AO

During a two-month period up to the last day of the SSA Convention, April 15, 1984, Falu Radioklubb could use the special prefix 7SK. The Swedish Telecommunications Authority very reluctantly issues special prefixes, but when they do, the number 7 before the regular prefix is the way they do it. Swedish hams were denied the WCY prefix last year so they do not issue special suffixes either! Anyway, maybe you managed to contact 7SK0AC in Stockholm, June 8 through 10, which is the second Swedish special prefix station for this year. The occasion was the European DX Council in Stockholm.

SPECIAL PREFIX TO SK7AX DENIED

On May 18, 1984, the city of Jonkoping celebrated its 700th anniversary. The radio club SVARK (Sodra Vatterbygdens Amatörradioklubb) issues a penant award to commemorate this anniversary. The rules for the Match Town Award were published in *73* for December, 1983, on page 154. SVARK applied for a special prefix but was denied this as "the anniversary had nothing to do with amateur radio."

THAILAND

Tony Waltham HS1AMH
c/o Bangkok Post
U Chuliang Building
Rama 4 Road
Bangkok 10500
Thailand

Director-General of the Thai Post and Telegraph Department, Mahidol Chantrangkoon, recently told a group of prominent radio amateurs at an informal get-together that he intended to legalize HF for amateur radio "by the end of this year." Acknowledging that he had the authority to legalize private amateur radio, he admitted that it would take a few months to persuade more senior government officials of the importance of the amateur service.

Radio amateurs in Thailand have—more or less voluntarily—been off the air since December 31, 1982, with the exception of legal HF operations during major contests such as the Southeast Asia Net Contest, the All Asia DX Contest, and the *CQ* Worldwide contests last year. This period of inactivity followed a warning by the previous Director of the Post and Telegraph Department to operators that they should bring their HF equipment to be disabled and sealed by Thai PTT officials. The warning came in December, 1982, and followed what had been tacit acceptance of amateur radio by the authorities, with administrative matters and operating procedures overseen by the Radio Amateur Society of Thailand, albeit in an unofficial capacity.

At that time, the previous PTT director had recently established a "Volunteer Radio Operator Network" of Thais who, after sitting and passing an examination in radio theory, had been granted licenses to operate on six spot frequencies in the two-meter amateur radio band.

The then Director-General of the PTT said that he envisaged this as a forerunner to full, legal amateur radio, but he had added that it "would take a long time, perhaps many years, before HF could be authorized."

Only Thai citizens were, and are, at the time of writing, granted permission to operate on these frequencies.

Operators were assigned a three-letter number to be preceded by the letters VR—unfortunately, the amateur prefix for British overseas territories (now only Pitcairn Island—VR6) retains this prefix. While this operation has been the nearest thing to amateur radio in Thailand, it does not conform with the IARU designation or international practice. According to these regulations, all contacts must be made in Thai and contact established first on a fixed calling frequency.

Appointed Director-General of the PTT late last year, Mr. Mahidol reportedly said that he felt that amateur radio in Thailand should conform to international practice and that he intended to authorize HF this year. However, he admitted that there were still some hurdles to overcome and that the VR service would be retained for the time being in order to demonstrate how useful amateur radio could be for the community.

Recently, Mr. Mahidol praised the VR operators for assisting the authorities during emergencies and in helping police should they witness a crime. Nevertheless, he reportedly said that all qualified amateur-radio operators should follow international law and conventions.

He also told this group of concerned Thai hams that the authorities saw no problem in issuing authorization in response to applications made by the Radio Amateur Society of Thailand (RAST) to operate during contests in the meantime.

Hams in Thailand are optimistic in the light of this frank discussion during which Mr. Mahidol gave open and well-thought-out answers to many questions regarding amateur radio and its future in Thailand.

He openly criticized certain individuals who, he said, were using their influence with senior officials and were operating illegally on amateur frequencies. He said it was difficult for the PTT to enforce the law in some cases, but that he firmly wanted to see amateur radio legalized, for which

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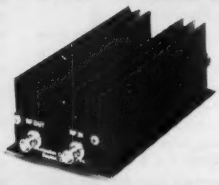

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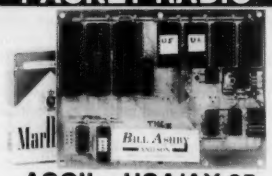

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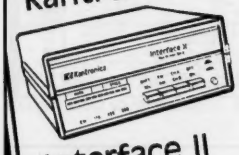

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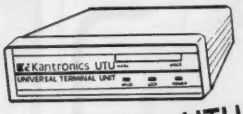

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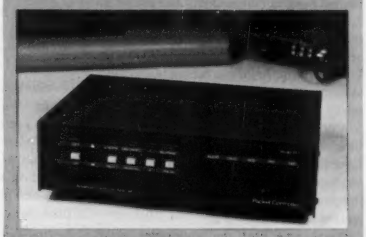

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the Thai Radio Communication Act of 1955 provides.

The PTT Director-General reportedly said that foreigners who resided in Thailand and who held licenses issued in their home countries could certainly apply to operate on HF. This was taken to imply that such foreign residents, many of whom live and work in Thailand and who had been active previously, but are now not operating, would have the chance to be back on the air in the near future.

Such sanctioning of private HF operations would be a big step forward for Thailand which has opted to step firmly into the science and technological era with a Science and Technology Transfer accord signed in Washington during the Thai Prime Minister's visit there last April.

Hope to see you all on the air soon!

VENEZUELA

Luis E. Suarez OA4KO/YV5
PO Box 66994
Carcas 1061-A
Venezuela

CIRCUITO 1 (YV1)

The call area YV1, or Circuito YV1 as named here, is composed of the states of Zulia, Trujillo, and Falcon, all located in the northwest of Venezuela. Both Zulia and Falcon face the Caribbean Sea, and Trujillo, in the Andes, is facing Maracaibo lake toward the west and the plains at the east.

Alonso de Ojeda was the name of the Spaniard who discovered the now-named Lake Maracaibo, well known for the oil it produces. At that time, 1499, he didn't imagine the wealth in oil that lay under the waters he was sailing on.

Ojeda saw that the aborigines built their houses on piles over the water and that people went from house to house in canoes and on bridges and walkways. This sight reminded the Spaniard of the Italian city of Venice, and so he called it the Gulf of Venezuela (little Venice). After that, the whole territory was named Venezuela.

Lake Maracaibo is the largest lake in the Americas. It is around 155 kms long by 120 kms wide, and the deepest it goes is around 50 meters. During the 16th and 17th century, almost every buccaneer and pirate tried a raid of Maracaibo city in search of asphalt to caulk the ships. In those days, getting it out of the lake was not an easy task, as now it is.

Trujillo and Falcon

Trujillo, the capital city, was founded in 1557 by Diego Garcia de Paredes. The location of the city was changed so many times that it was once named the Portable City. The city is very small, long, and narrow, being only two blocks wide, and runs up through a mountain gorge.

The whole coast of Venezuela including the coast of Falcon was discovered in 1499 by Alonso de Ojeda. Falcon is a state of incredible contrasts. From beautiful beaches one next sees the wide coastal plain forming a small desert with light dunes, cactus, and sparse scrub thickets. Toward the south, the mountains are dressed with dense vegetation and lush forest.

Atop the mountains of Circuito YV1 are located a bunch of repeaters—9 in Zulia, 2 in Falcon, and 2 in Trujillo. Radio clubs are spread all around the main cities of those states.

Near Valencia city, in YV4-land, there is a repeater site on a mountain named El Cafe. The place is very easy to reach in a double-track vehicle. There is a site there for several dozen VHF and UHF repeaters, including many microwave links, police, fire, and civil defense two-way repeaters, plus many commerical ones.

One day, as I do regularly, I went up the mountain to inspect a couple of community repeater systems. While getting back from El Cafe, I thought about the possibility of linking amateurs throughout the whole country via 2-meter-FM repeaters. It already has been done by the telephone company, military stations, and commercial repeaters, but as far as amateur radio is concerned, repeaters have been installed without coordination.

Nevertheless, it is important to know that if you travel by car you may reach a repeater unless you are more than 200 km south and east of the Andes. And almost always you may reach more than one repeater by switching channels. At this time, two clubs have joined efforts and linked call areas 1, 2, 4, 5, and part of 3.

But, as I mentally went over the area, I went further. Why not link the Bolivarian countries? Bolivia, Colombia, Ecuador, Peru, and Venezuela all are Andean countries with the same interests, language, and history. During the trip to Caracas, I mentally looked at the map of South America trying to imagine the Andes crossing our countries. I was sure it could be done.

Back home, I took a look at a real map and confirmed that the Andes offer us the way to link the Bolivarian countries. To make things better, Panama, also a Bolivarian country, could also be linked. I was thinking about this for several days, and each new day I was much more convinced of the feasibility of this project.

During the Primer Seminario de Radioaficionados (First Radio Amateur Seminary), sponsored by Asociacion de Radioaficionados de Venezuela (ARV), it was very rewarding to hear Hebert Gonzalez YV1AHP offer to the ARV the possibility of linking one of the repeaters in Zulia state (installed by Amigos de los Dos Metros) with one of the repeaters sponsored by ARV. The offer was accepted and there is a project on the way. I asked the panel, during the meeting, about my idea—the Red Bolivariana de Repetidoras, as I thought it could be named. The panel accepted that technically it was feasible but had reservations about coordination among all five countries.

So far, I have talked with some OAs and some HKs and they thought also that it could be done.

At this moment, the project to link call areas 1 to 5 is a reality due to the effort of above-mentioned clubs. Now any amateur in Caracas is able to contact a friend in Maracaibo or a mobile in the Andeans. One-third of Venezuela is already linked via 2-meter-FM repeaters. The link is working very well—and even covers Valle Dupar in Colombia and the Antilles when propagation permits.

Here is my proposition: I wish that all amateurs in the Bolivarian countries interested in the project would drop me a line indicating how they could help. We need coordinators for each country, repeater sites, equipment, operating licenses from respective Ministries of Communications, etc. I wish to know what is already installed. We must know what is in operation on country borders and what could be used and what could not. We need criticisms, opinions, and facts (not just complaints!) and I will forward the information to both the Sociedad Amigos de los 2-Metros and Proyecto 79, since (to my knowledge) they are the most capable and enthusiastic. Besides, by the time this is published, they may have linked Venezuela from east to west along the north side of this country.

More than 150 years ago Bolivar crossed the Andes on horses and on foot without technology—just with valor and goodwill. This is not a legend, it is history. Don't tell me that we cannot cross the Andes by radio! According to my knowledge, the most difficult country to link is Peru because the Andes cross the country along its axis.

Anyhow, procedures can be developed later. At this time the most important thing is related to hardware. Maybe some links could be at 10 meters or whatever is available using FM. I think that if 10 meters is used, the mode should be FM, not SSB, for the sake of intelligibility.

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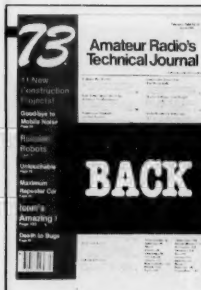

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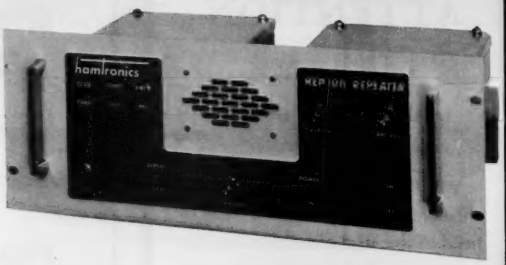

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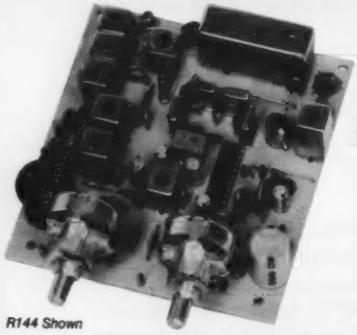

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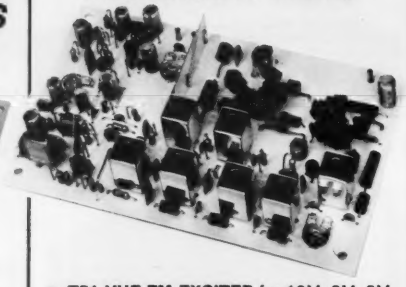

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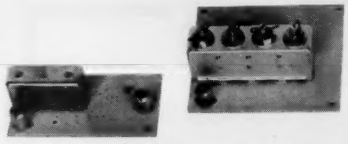

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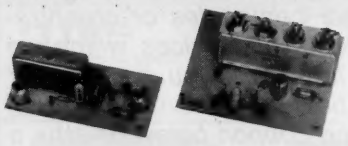

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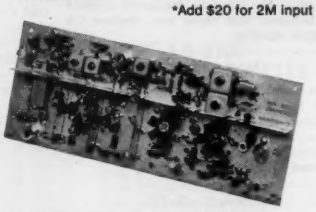

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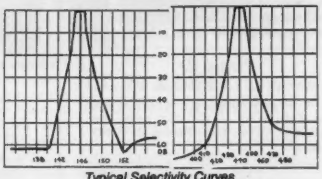

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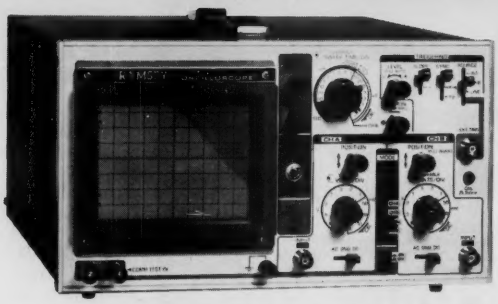
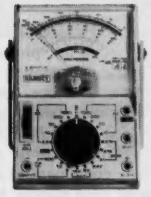


NEW FROM RAMSEY–20 MHz DUAL TRACE OSCILLOSCOPE

Unsurpassed quality at an unbeatable price, the Ramsey oscilloscope compares to others costing hundreds more. Features include a component testing circuit that will allow you to easily test resistors, capacitors, digital circuits and diodes • TV video sync filter • wide bandwidth & high sensitivity • internal graticule • high quality rectangular CRT • front panel trace rotator • Z axis • high sensitivity x-y mode • very low power consumption • regulated power supply • built-in calibrator • rock solid triggering • high quality hook-on probes

$399.95 high quality hook-on probes included



RAMSEY D-1100 VOM-MULTITESTER

Compact and reliable, designed to service a wide variety of equipment. Features include • mirror back scale • double-jeweled precision moving coil • double overload protection • an ideal low cost unit for the beginner or as a spare back-up unit.

$19.95

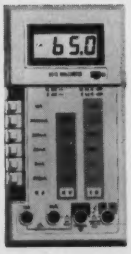
test leads and battery included

RAMSEY D-2100 DIGITAL MULTITESTER

A compact easy to use unit designed to operate like a pro. Featuring • 3½ digit LCD • low BAT. indicator • all range overload protection • overrange indication • auto-polarity • Transistor tester • dual-slope integration • vinyl carrying case

$54.95

h_{FE} test leads, battery & vinyl carrying case included



RAMSEY D-3100 DIGITAL MULTIMETER

Reliable, accurate digital measurements at an amazingly low cost • In-line color coded push buttons, speeds range selection • abs plastic tilt stand • recessed input jacks • overload protection on all ranges • 3½ digit LCD display with auto zero, auto polarity & low BAT. indicator

$59.95

test leads and battery included

CT-70 7 DIGIT 525 MHz COUNTER

Lab quality at a breakthrough price. Features • 3 frequency ranges each with pre amp • dual selectable gate times • gate activity indicator • 50mV @ 150 MHz typical sensitivity • wide frequency range • 1 ppm accuracy

$119.95

wired includes AC adapter

CT-70 kit $99.95
BP-4 nicad pack 8.95

CT-90 9 DIGIT 600 MHz COUNTER

The most versatile for less than $300. Features 3 selectable gate times • 9 digits • gate indicator • display hold • 25mV @ 150 MHz typical sensitivity • 10 MHz timebase for WWV calibration • 1 ppm accuracy

$149.95

wired includes AC adapter

CT-90 kit $129.95
OV-1 0.1 PPM oven timebase ... 59.95
BP-4 nicad pack 8.95

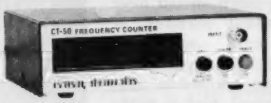
CT-125 9 DIGIT 1.2 GHz COUNTER

A 9 digit counter that will outperform units costing hundreds more. • gate indicator • 24mV @ 150 MHz typical sensitivity • 9 digit display • 1 ppm accuracy • display hold • dual inputs with preamps

$169.95

wired includes AC adapter

BP-4 nicad pack 8.95



CT-50 8 DIGIT 600 MHz COUNTER

A versatile lab bench counter with optional receive frequency adapter, which turns the CT-50 into a digital readout for most any receiver • 25 mV @ 150 MHz typical sensitivity • 8 digit display • 1 ppm accuracy

$169.95

wired

CT-50 kit $139.95
RA-1 receiver adapter kit 14.95

DM-700 DIGITAL MULTIMETER

Professional quality at a hobbyist price. Features include 26 different ranges and 5 functions • 3½ digit, ½ inch LED display • automatic decimal placement • automatic polarity

$119.95

wired includes AC adapter

DM-700 kit $99.95
MP-1 probe set 4.95

PS-2 AUDIO MULTIPLIER

The PS-2 is handy for high resolution audio resolution measurements, multiplies UP in frequency • great for PL tone measurements • multiplies by 10 or 100 • 0.01Hz resolution & built-in signal preamp/conditioner

$49.95

wired

PS-2 kit $39.95

PR-2 COUNTER PREAMP

The PR-2 is ideal for measuring weak signals from 10 to 1,000 MHz • flat 25 db gain • BNC connectors • great for sniffing RF • ideal receiver/TV preamp

$44.95

wired includes AC adapter

PR-2 kit $34.95

PS-1B 600 MHz PRESCALER

Extends the range of your present counter to 600 MHz • 2 stage preamp • divide by 10 circuitry • sensitivity 25mV @ 150 MHz • BNC connectors • drives any counter

$59.95

wired includes AC adapter

PS-1B kit $49.95

ACCESSORIES FOR RAMSEY COUNTERS

Telescopic whip antenna—BNC plug	$ 8.95
High impedance probe, light loading	16.95
Low pass probe, audio use	16.95
Direct probe, general purpose use	13.95
Tilt bail, for CT-70, 90, 125	3.95

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TERMS: • satisfaction guaranteed • examine for 10 days, if not pleased, return in original form for refund • add 6% for shipping and insurance to a maximum of $10.00 • overseas add 15% for surface mail • COD add $2.50 (COD in USA only) • orders under $15.00 add $1.50 • NY residents add 7% sales tax • 90 day parts warranty on all kits • 1 year parts & labor warranty on all wired units

RAMSEY

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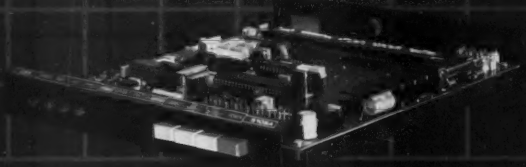
See List of Advertisers on page 98

With SMART PATCH You are in CONTROL

With CES 510SA Simplex Autopatch, there's no waiting for VOX circuits to drop. Simply key your transmitter to take control.



SMART PATCH is all you need to turn your base station into a personal autopatch. SMART PATCH uses the only operating system that gives the mobile complete control. Full break-in capability allows the mobile user to actually interrupt the telephone party. SMART PATCH does not interfere with the normal use of your base station. SMART PATCH works well with any FM transceiver and provides switch selectable tone or rotary dialing, toll restrict, programmable control codes, CW ID and much more.

To Take CONTROL with Smart Patch – Call 800-327-9956 Ext. 101 today.

What To Look For In A Phone Patch

The best way to decide what patch is right for you is to first decide what a patch should do. A patch should:

- Give complete control to the mobile, allowing full break in operation.
- Not interfere with the normal operation of your base station. It should not require you to connect and disconnect cables (or flip switches!) every time you wish to use your radio as a normal base station.
- Not depend on volume or squelch settings of your radio. It should work the same regardless of what you do with these controls.
- You should be able to hear your base station speaker with the patch installed. Remember, you have a base station because there are mobiles. ONE OF THEM MIGHT NEED HELP.
- The patch should have standard features at no extra cost. These should include programmable toll restrict (dip switches), tone or rotary dialing, programmable patch and activity timers, and front panel indicators of channel and patch status.

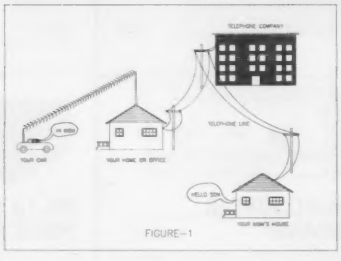
ONLY SMART PATCH HAS ALL OF THE ABOVE.

Now Mobile Operators Can Enjoy An Affordable Personal Phone Patch. . .

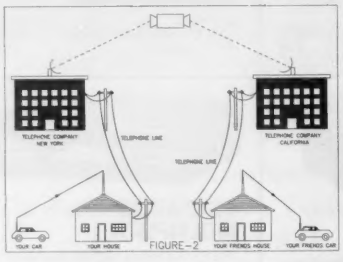
- Without an expensive repeater.
- Using any FM tranceiver as a base station.
- The secret is a SIMPLEX autopatch, The *SMART PATCH*.

SMART PATCH Is Easy To Install

To install *SMART PATCH*, connect the multicolored computer style ribbon cable to mic audio, receiver discriminator, PTT, and power. A modular phone cord is provided for connection to your phone system. Sound simple? . . . IT IS!



FIGURE–1



FIGURE–2

How To Use *SMART PATCH*

Placing a call is simple. Send your access code from your mobile (example: *73). This brings up the Patch and you will hear dial tone transmitted from your base station. Since *SMART PATCH* is checking about once per second to see if you want to dial, all you have to do is key your transmitter, then dial the phone number. You will now hear the phone ring and someone answer. Since the enhanced control system of *SMART PATCH* is constantly checking to see if you wish to talk, you need to simply key your transmitter and then talk. That's right, you simply key your transmitter to interrupt the phone line. The base station automatically stops transmitting after you key your mic. *SMART PATCH* does not require any special tone equipment to control your base station. It samples very high frequency noise present at your receivers discriminator to determine if a mobile is present. No words or syllables are ever lost.

SMART PATCH Is All You Need To Automatically Patch Your Base Station To Your Phone Line.

Use *SMART PATCH* for:

- Mobile (or remote base) to phone line via Simplex base. (see fig 1.)
- Mobile to Mobile via interconnected base stations for extended range. (see fig. 2.)
- Telephone line to mobile (or remote base).
- *SMART PATCH* uses SIMPLEX BASE STATION EQUIPMENT. Use your ordinary base station. *SMART PATCH* does this without interfering with the normal use of your radio.

WARRANTY?
YES, 180 days of warranty protection. You simply can't go wrong.
An FCC type accepted coupler is available for *SMART PATCH*.

CES® ✓462

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P.O. Box 2930, Winter Park, Florida 32790
Telephone: (305) 645-0474 **Or call toll-free (800)327-9956**

YAESU FT-726R TRIBANDER

NEW GALAXIES OF PERFORMANCE ON VHF AND UHF

FULL DUPLEX!!

SATELLITES!!

SCATTER!!

FM!!

EME!!

The New Yaesu FT-726R Tribander is the world's first multiband, multimode Amateur transceiver capable of full duplex operation. Whether you're interested in OSCAR, moonbounce, or terrestrial repeaters, you owe yourself a look at this one-of-a-kind technological wonder!

Multiband Capability

Factory equipped for 2 meter operation, the FT-726R is a three-band unit capable of operation on 10 meters, 6 meters, and/or two segments of the 70 cm band (430-440 or 440-450 MHz), using optional modules. The appropriate repeater shift is automatically programmed for each module. Other bands pending.

Advanced Microprocessor Control

Powered by an 8-bit Central Processing Unit, the ten-channel memory of the FT-726R stores both frequency and mode, with pushbutton transfer capability to either of two VFO registers. The synthesized VFO tunes in 20 Hz steps on SSB/CW, with selectable steps on FM. Scanning of the band or memories is provided.

Full Duplex Option

The optional SU-726 module provides a second, parallel IF strip, thereby allowing full duplex crossband satellite work. Either the transmit or receive frequency may be varied during transmission, for quick zero-beat on another station or for tracking Doppler shift.

High Performance Features

Borrowing heavily from Yaesu's HF transceiver experience, the FT-726R comes equipped with a speech processor, variable receiver bandwidth, IF shift, all-mode squelch, receiver audio tone control, and an IF noise blanker. When the optional XF-455MC CW filter is installed, CW Wide/Narrow selection is provided. Convenient rear panel connections allow quick interface to your station audio, linear amplifier, and control lines.

Leading the way into the space age of Ham communications, Yaesu's FT-726R is the first VHF/UHF base station built around modern-day requirements. If you're tired of piecing together converters, transmitter strips, and relays, ask your Authorized Yaesu Dealer for a demonstration of the exciting new FT-726R, the rig that will expand your DX horizons!

Price And Specifications Subject To Change Without Notice Or Obligation

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The radio.

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YAESU CINCINNATI SERVICE CENTER 9070 Gold Park Drive, Hamilton, OH 45011 • (513) 874-3100

KENWOOD

pacesetter in amateur radio

TS-930S "DX-traordinary"

TS-930S

We call it "DX-traordinary" because the TS-930S has now become the favorite rig of the serious contester! Its superior capability for full break-in split-frequency operation, the speed and convenience with which its eight memory channels can be accessed, its unsurpassed receiver dynamic range and its remarkable ability to select the desired signal during periods of heavy QRM, utilizing VBT, Slope tuning, IF Notch filtering, and tuneable audio filtering, have all combined to make this the rig that gives you the EXTRA EDGE!

The TS-930S is loaded with all the special features that you always wanted in an HF transceiver. Full coverage of the 160 through 10 meter bands, including the new WARC frequencies, (easily modified for HF MARS), plus a general coverage receiver that can tune any frequency from 150 kHz to 30 MHz. Operation in the SSB, CW, FSK, and AM modes, with selectable full or semi CW break-in. All solid-state, with 250 watts PEP input on SSB, CW, FSK, and 80 watts input on AM. SWR/power meter. Triple final protection circuits plus two cooling fans built-in. 10-Hz step synthesized frequency control. Available with optional automatic antenna tuner built-in, another industry first! Dual digital VFO's. Eight memory channels that store both frequency and band information, with internal battery back-up, (batteries not supplied). Dual mode adjustable noise blankers, especially effective in eliminating "woodpecker" type interference. SSB IF slope tuning, for maximum rejection of interference. CW variable bandwidth, with pitch and sidetone control. IF notch filter. Tuneable audio peaking filter. Unique six digit white fluorescent tube digital display is easy-on-the-eyes during those long contests. RF speech processor, for higher average "talk-power." SSB monitor circuit. 4-step RF attenuator. VOX. 100-kHz marker. AC power supply built-in, 120, 220, or 240 VAC.

TS-930S Optional Accessories: AT-930 automatic antenna tuner, SP-930 external speaker, with selectable audio filters, YG-455C-1 (500 Hz), YG-455CN-1 (250 Hz), YK-88C-1 (500 Hz) CW filter, YK-88A-1 (6 kHz) AM filter, all plug-in type. SO-1 commercial stability TCXO, MC-60A deluxe desk microphone, MC-80 and MC-85 communications microphones, MC-42S mobile hand microphone, TL-922A linear amplifier (not for CW QSK), SM-220 station monitor, PC-1A phone patch, SW-2000 SWR/power meter, 160 ~ 6 meter, SW100A SWR/power/volt meter 160-2m HS-4, HS-5, HS-6, and HS-7 headphones.

Isn't it about time you stepped into the winner's circle?

More information on the TS-930S is available from authorized dealers of Trio-Kenwood Communications, 1111 West Walnut Street, Compton, California 90220.

Specifications and prices are subject to change without notice or obligation.